"PROSPECTIVE RANDOMISED CONTROL STUDY FOR EVALUATING THE EFFICACY OF ULTRASOUND GUIDED CONTINUOUS TRANSVERSE ABDOMINIS PLANE BLOCK IN PATIENTS UNDERGOING LOWER SEGMENT CAESERIAN SECTION, FOR POSTOERATIVE ANALGESIA"

Dissertation submitted to

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in partial fulfilment for the award of the degree of

DOCTOR OF MEDICINE

IN

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INSTITUTE OF ANAESTHESIOLOGY

& CRITICAL CARE

MADRAS MEDICAL COLLEGE

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CERTIFICATE

This is to certify that the dissertation entitled, **"PROSPECTIVE RANDOMISED CONTROL STUDY FOR EVALUATING THE EFFICACY OF ULTRASOUND GUIDED TRANSVERSE ABDOMINIS PLANE BLOCK IN PATIENTS UNDERGOING LOWER SEGMENT CAESAREAN SECTION, FOR POSTOPERATIVE ANALGESIA"** submitted by **Dr.DIVYA.D** in partial fulfilment for the award of the degree of Doctor of Medicine in Anaesthesiology by The Tamilnadu Dr. M.G.R. Medical University, Chennai is bonafide record of the work done by her in the INSTITUTE OF ANAESTHESIOLOGY & CRITICAL CARE, Madras Medical College, during the academic year 2010-2013.

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DECLARATION

I hereby declare that the dissertation entitled **"PROSPECTIVE RANDOMISED CONTROL STUDY FOR EVALUATING THE EFFICACY OF ULTRASOUND GUIDED TRANSVERSE ABDOMINIS PLANE BLOCK IN PATIENTS UNDERGOING LOWER SEGMENT CAESERIAN SECTION, FOR POSTOPERATIVE"** has been prepared by me under the Guidance of **PROF. DR R. RAJENDRAN. M.D., D.A.,** Professor of Anesthesiology, Institute of Anesthesiology and Critical Care, Madras Medical College, Chennai, in partial fulfillment of the regulations for the award of the degree of M.D [Anesthesiology], examination to be held in April 2013.

This study was conducted at Department of Anaesthesiology, Institute of Obstetrics and Gynaecology, Madras Medical College, Chennai.

I have not submitted this dissertation previously to any university forthe award of any degree or diploma.

Date:

Place: Chennai **Dr. D. DIVYA**

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INTRODUCTION

Rafi et al[8] first in 2001 described a relatively new technique named **Transverse Abdominis Plane block.** It is a type of regional anaesthesia that provides analgesia to pain arising from the pareital peritoneum, skin and muscles of anterior abdominal wall. This technique is technically safe to perform especially under ultrasound guidance.

These studies showed that Transverse Abdominis Plane Block significantly reduced the requirement of analgesics, but the effect wore off within 24 hours. So the trend now is performing studies directed towards continuous Transverse Abdominis Plane block and thus, obtain its benefit for a prolonged period.

Effective pain control is a very important aspect in patients undergoing surgeries, especially in parturient mothers undergoing caesarean section. They have to be alert, awake and painless so as to take good care of newborn baby.

We have been using epidural analgesia for postoperative pain relief using local anaesthetic agents with or without supplemental opioids. However there is always a major group of patients in whom this technique is not used. Also there is a small group of patients in whom this contraindicated or not possible.

These patients receive intravenous opioids through Patient Controlled Analgesia system for postoperative analgesia. Apart from being less efficient in providing analgesia, the opioid related side effects like nausea, vomiting, respiratory depression, sedation are of major concerns. In addition these opioids can get transferred through lactation and affect the newborn. Thus addition of Transverse Abdominis Plane block certainly will reduce the requirement of opioids by blocking the somatic component of pain.

Performing this block under ultrasound guidance increases the safety of this block. And continuing this analgesia by placement of a catheter in situ will

significantly reduce the total opioid consumption postoperatively.

Keeping this in mind we conducted a double blinded prospective randomised control study at Institute of Obstetrics and Gynaecology, where patients undergoing caesarean section under spinal anaesthesia were given bilateral continuous Transverse Abdominis Plane blocks after surgery and intravenous Fentanyl given on demand.

AIM OF THE STUDY

To evaluate the efficacy of ultrasound guided Transverse Abdominis Plane block as continuous analgesic technique, thus ultimately reducing post operative opioid requirements.

ULTRASONOGRAM – PRICIPLES[22]

Ultrasonogram is based upon the principle of piezoelectric effect.

- This phenomenon was discovered by the Curies in 1880 using natural quartz
- Applied in use for Diagnostic Medical applications since late 1950’s
- Frequency ranges used in medical ultrasound imaging range from 2 - 15 MHz

PIEZOELECTRIC EFFECT

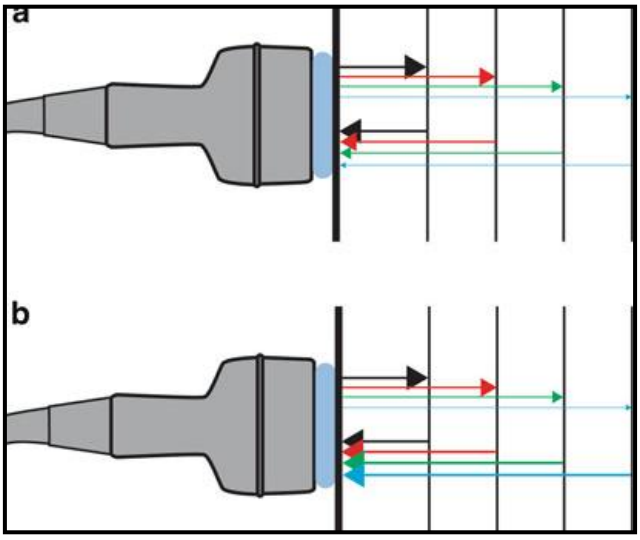
Piezoelectric Effect is defined as the principle of converting electrical energy into mechanical energy. The reverse of the piezoelectric effect converts the energy back to its original form.

PIEZOELECTRIC EFFECT AND ULTRASOUND TRANSDUCERS

- A transducer converts one type of energy into another.
- Based upon the pulse-echo principle, transducers convert:

a. Electricity into sound = pulse

b. Sound into electricity = echo



PULSE

- Pulse is the wave which is sent to the soft tissues
- Interaction of this sound wave with soft tissue is called bio effect.
- Pulsing is determined by the transducer or probe crystal(s) and is not operator controlled.

ECHO

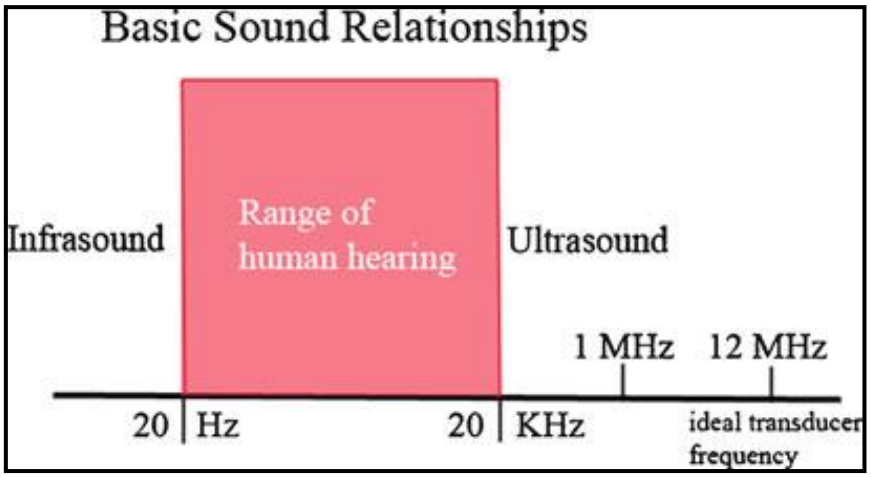
- Echo is wave produced by soft tissues
- Echoes are received back by the transducer crystals which are interpreted and processed by the ultrasound machine.

FREQUENCY

- Number of complete cycles per unit of time
- One cycle per second = one Hertz ***(Hz)***
- Transducer Frequencies:
- 2.5 – 3.5 MHz – abdomen, obstetrics and gynaecology
- 5.0 – 7.5 MHz – breast, thyroid
- 7.5 – 10 MHz – Superficial veins, Superficial structures

Thus

- *High frequency gives*
  - Improved resolution with less depth of penetration
  - Used for superficial uses
- *Low frequency gives*
  - Poorer resolution with full depth of penetration
  - For general abdomino-pelvic uses
- Transducer frequency in ultrasound machine is predetermined by design



WAVELENGTH

- Distance between consecutive cycles of sound.

BANDWIDTH

- A range of frequencies is termed *bandwidth*

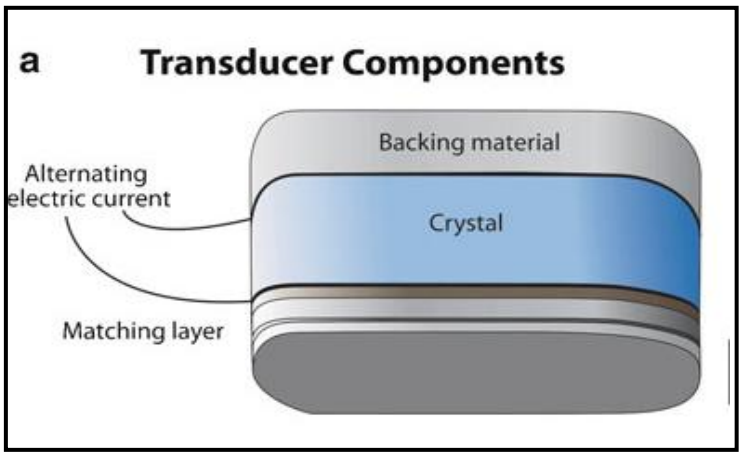
- Broad bandwidth transducers contain more than one operating frequency

AXIAL & LATERAL RESOLUTION

- Spatial Resolution describes how physically close two objects can be and displayed separately.
  - *Axial*: along the beam path
  - *Lateral*: perpendicular to beam path
- Normally used spatial resolution is1.0 mm or less.

MACHINE COMPONENTS

1. TRANSDUCER



Types:

- **Mechanical**
  - Oscillating

- Rotating

- **Electronic**
  - Linear Arrays
  - Curved Arrays
  - Phased Arrays

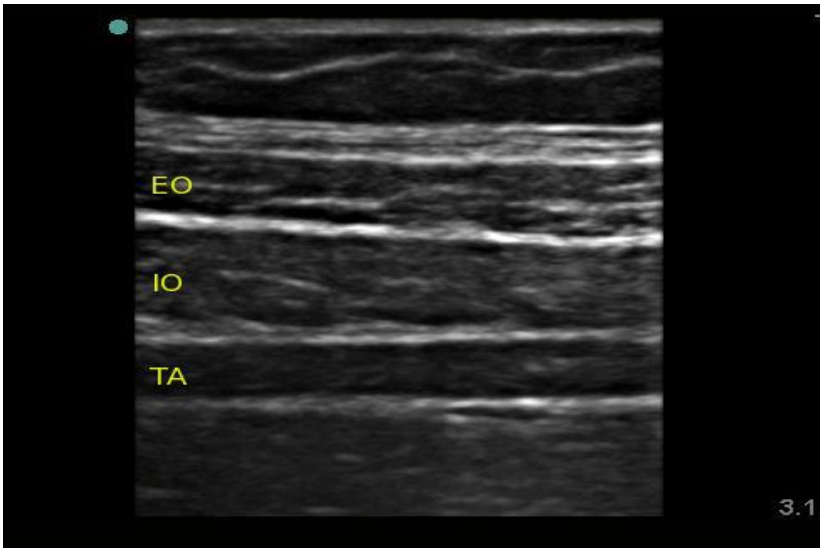
2. RECEIVER
3. MEMORY
4. DISPLAY

FIELD OF VIEW SHAPES

Sector FOV

- Produced by oscillating/ rotating curved arrays, phased arrays
- Typically used in cardiac and abdominal application

Linear FOV



- Produced by linear arrays
- Typically used in superficial application

PROBE TYPES

CURVI Linear, Low Frequency Probe

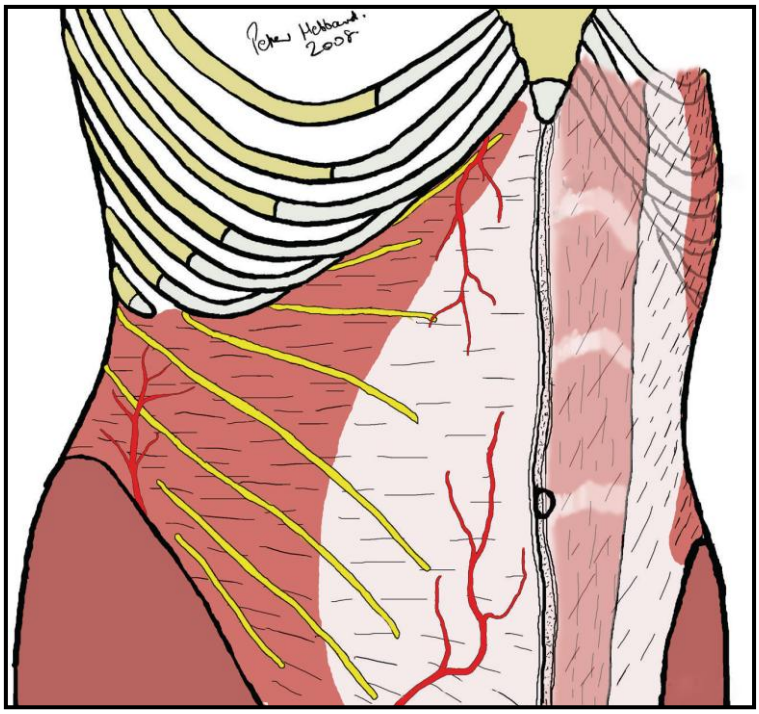
Linear, High Frequency Probe

DISPLAY MODES

- **B Mode** - 2 dimensional
- **M Mode** - records moving echoes from the heart in display, thus the motion could be interpreted in terms of myocardial and valvular function.
- **Doppler** - here the frequency shift in echo is measured after a certain time.
- **Colour Doppler** - uses colour corresponding to frequency shift; red for near to and blue for away from the probe.

ANATOMY OF ANTERIOR ABDOMINAL WALL[24,25]

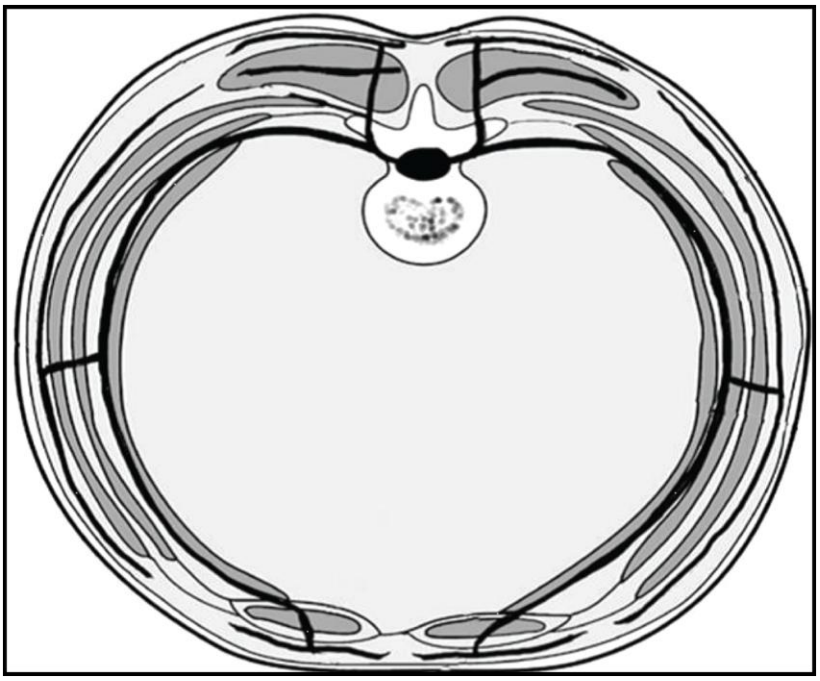
The anterior abdominal wall is innervated by the anterior primary rami of – L1 spinal nerves. The anterior primary rami travel anteriorly and supply the anterior abdominal wall.



Nerve supply of anterior abdominal wall

- The anterior rami of T7 – T11 travel anteriorly in the intercostal space giving rise to a lateral cutaneous branch after piercing through external abdominis muscle.

- This further divides into an anterior and posterior branch thatsupply the external oblique and lattismus dorsi respectively.
- They continue anteriorly in between internal oblique and transverse abdominis muscles until they reach rectus abdominis, wherein they give rise to anterior cutaneous branch and ends by supplying the skin of anterior abdominal wall.



ANATOMY OF NERVE SUPPLY

- The anterior rami of T12 descends in between internal oblique and transverse abdominis muscles, giving rise to a lateral cutaneous branch which pierces the

external oblique to supply skin over front part of gluteal region.

- It communicates with the iliohypogastric nerve and gives motor supply to the pyramidalis and the rectus muscles.
- The rami of L1 lies in between internal oblique and transverse abdominis muscle, near the iliac crest, supplying a part of skin covering genitalia, upper and medial part of the thigh.

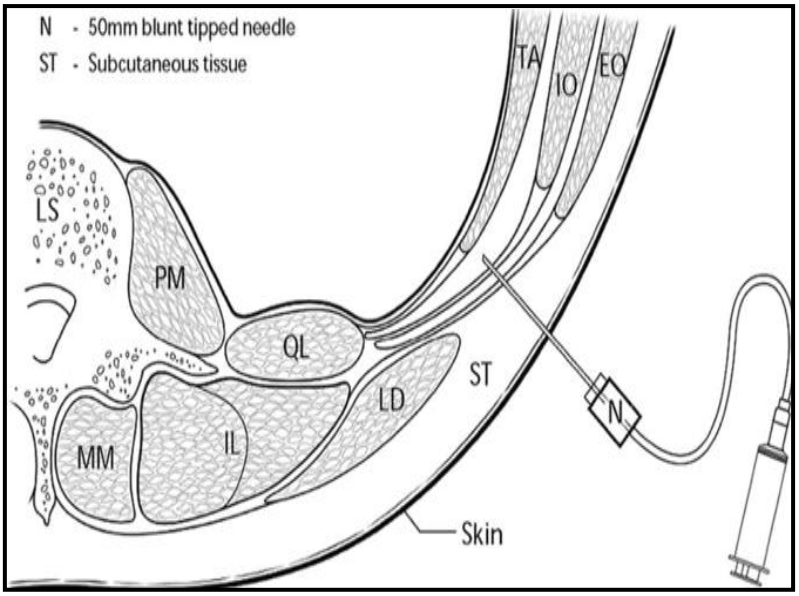
LOWER LUMBAR TRIANGLE OF PETIT[23, 24,5,13]

- This is a deficiency in the anterior abdominal muscle wall, situated in between iliac crest and lower costal margin in the midaxillary line.
- Bounded anteriorly by lateral border of external oblique and posteriorly by the lateral border of lattismus dorsi.
- Base is formed by the aponeurosis of external, internal oblique and transverse abdominis muscle. Thus it gives the characteristic ‘pop of’ feel we get during blind method of Transverse Abdominis Plane block.

- Sometimes it will be difficult to identify this triangle in obese patients wherein it is suggested to insert the needle about 2.5 cm behind the highest point of iliac crest.
- Lifting up of the head and shoulder with patient in supine position causes contraction of the abdominal muscles and facilitate in palpation of this triangle. Thus this is a very important landmark for Transverse Abdominis Plane block.

BLOCK TECHNIQUE

The aim of this technique is to deposit the local anaesthetic solution in between internal oblique and transverse abdominis muscle so that the spinal nerves passing in this plane get blocked. This block requires high volume of local anaesthetic, so the dose is calculated and administered in lower concentrations safely so as to not exceed toxic limits.



There are 3 techniques through which we can enter this tissue plane:

1. Anatomical landmark based
2. Ultrasound guided
3. Surgeon assisted approach

Blind method:

- In the anatomical landmark based technique, we enter the plane through the Petit's triangle, wherein we rely upon two characteristic 'pop of' sensation while passing a blunt needle through it.
- The first pop of occurs when we pierce through the external oblique aponeurosis and second one by internal oblique aponeurosis.
- Optimal positioning is supine position without any hip flexion. To accentuate the border of latismus dorsi, ipsilateral arm can be raised above head level.
- In obese patients however excessive subcutaneous fat increases the depth of Transverse Abdominis Plane. Thus in supine position the excessive fat hangs over the flanks, making it difficult for needle placement and visualisation and also ultrasound probe positioning. In such cases semilateral position is ideal, by placing a wedge on the ipsilateral side.
- Petit's triangle is identified by palpating the anterior iliac crest and following posteriorly until reaching latismus dorsi. Skin may be marked using a marker to make it easier.

STEPS OF TAP BLOCK[8,5,24, 25]

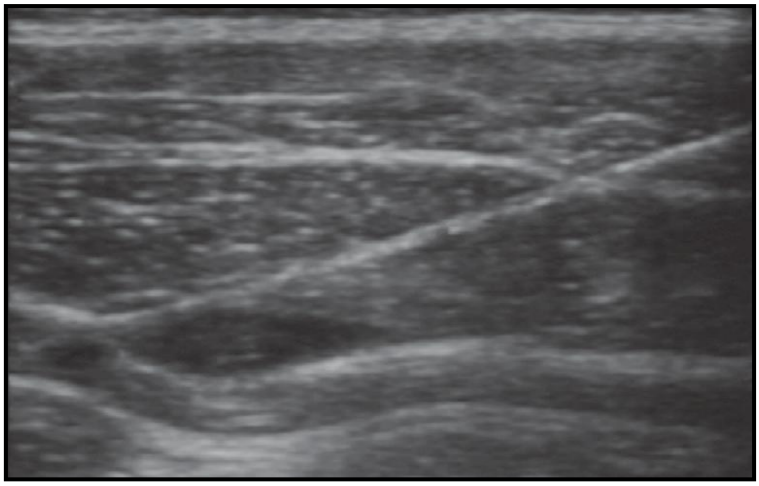
- As this is an invasive procedure into a relatively avascular plane, sterile aseptic precautions are to be followed. Skin is disinfected using povidone iodine with a minimum contact time of 3 minutes.
- If patient is not having adequate level of blockade or not sedated, local infiltration of the entry point with 1 – 3ml of 2% lignocaine, using an intramuscular needle. Patients having residual spinal or epidural effect will not require this.
- A 22G, 2 inches long needle with a blunted end provides a good sensation of the different muscle layers passed through.
- With the anaesthetist standing on opposite or same side, the needle is placed in 90^{o} angle and inserted in the middle of the triangle of Petit.
- Two significant pops corresponding to the external and internal oblique aponeurosis will be felt.
- After the second pop, which is approximately 1 – 1.5 inches deep, we will be lying in the plane between

internal oblique and transverse abdominis muscle, wherein the neural bundle is available.

- Local anaesthetic solution is injected following negative aspiration, in increments. Usually second pop of is felt within 1cm apart the first one. If failure to detect this pop feel, needle must be withdrawn and procedure repeated.
- For incisions confined to one side of the midline, unilateral blocks are enough, Eg. Inguinal hernia, appendicectomy; whereas incisions crossing the midline Eg. Pfannensteil, bilateral blocks will be required.
- This Transverse Abdominis Plane block takes upto 30min to be effective and hence supplementation with an opioid will be required during start of surgery.

Ultrasound guided method:

Here we use a high frequency probe (7 – 12 Hz) placed in middle between lower costal margin and iliac crest in the midaxillary line. The probe is first kept anteriorly over rectus sheath and then drawn laterally to follow the fascial planes correctly.



An ideal view demonstrates

- Subcutaneous tissue
- External oblique muscle
- Internal oblique muscle
- Transverse abdominis muscle
- Peritoneum
- Intraabdominal organs.

STEPS OF TAP BLOCK

- A 20G, 10 cm long needle is preferable. After visualising the plane with the ultrasound probe, the needle is introduced anteriorly in-plane or out of plane, visualising the whole needle length and/or tip of the needle respectively.

- After placement in plane, confirm by injecting 1 – 2ml of the anaesthetic solution – Hydrodissection method – which makes visualisation of the plane easier and also makes catheter placement for continuous Transverse Abdominis Plane block easier.
- Correct placement produces an echoluscent, lens shaped space with clear borders lying within the internal oblique and transverse abdominis plane.

3. Surgeon assisted approach:

It is used along with blind method. Here the injection site is observed through a laparoscopic camera, a peritoneal bulge will be seen if block is correctly delivered. Also a method of direct visualisation of Transverse Abdominis Plane block by dissecting through the internal and external oblique muscles have been described in a study done by Araco et al.

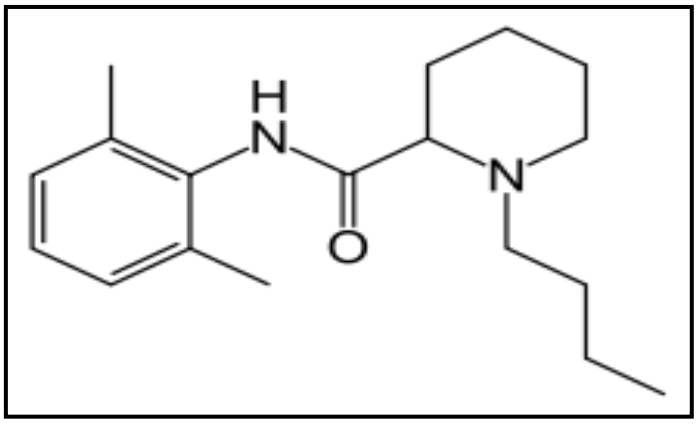
PHARMACOLOGY OF BUPIVACAINE[1,3,4,5]

Bupivacaine is an amide local anaesthetic, synthesized by A.F.Ekenstam in 1957 and brought into clinical use in 1963.

It is produced for clinical use in a racemic mixture, containing equal proportions of the 'S' and 'R' enantiomers. It is supplied for clinical use as a hydrochloride salt.

Chemical Structure

Description: ± 1- Butyl-N-(2, 6-dimethylphenyl) – 2-piperidine Decarboxamide Hydrochloride monohydrate.



Physico-chemical Profile

Molecular weight (base)	-	288
pKa	-	8.1
Lipid Solubility	-	28
Plasma Protein Binding	-	95%

Mechanism of Action

- Bupivacaine exerts its effects by inhibition of sodium channels. It acts by blocking the conduction in the nerves.
- This occurs by decrease in or prevention of the large transient increases in permeability of the cell membrane to sodium ions that follows depolarization of the membrane.
- Bupivacaine also reduces the permeability of the resting nerve membrane to potassium as well as sodium ions.

Pharmacodynamics

Bupivacaine by virtue its pharmacological effects, has a stabilizing action on all excitable membranes. In the central nervous system, stimulation can occur producing

restlessness, tremors and convulsions in over dosage. Bupivacaine also causes a reduction in the automaticity of the heart.

The clinical profile of nerve blockade produced by Bupivacaine differs from that of lignocaine. It is 4 times more potent than lignocaine, but the onset of action is slower. The duration of action is considerably longer. The sensory block produced by Bupivacaine tends to be more marked than the motor block.

Pharmacokinetics

Bupivacaine is rapidly absorbed from the site of injection. The rate of rise in plasma Bupivacaine concentration and the peak plasma concentrations obtained depend on the route of administration.

There is also some inter individual variation and peak systemic concentrations may occur between 5 and 30 minute after administration. The addition of vasoconstrictor delays absorption and results in lower plasma concentration of Bupivacaine.

Pharmacokinetic Profile

Volume of distribution at steady rate (Vdss)	72 lrs
Clearance	0.47 L.min
t½α	2.7 min
t½β	28 min
t½γ	3.5 hrs

Metabolism

Possible pathways for metabolism of Bupivacaine include aromatic hydroxylation, N-dealkylation, amide hydrolysis and conjugation. Only the N-dealkylated metabolic N-esmethylbupivacaine has been measured in blood and urine after epidural and spinal administration.

The degradation of Bupivacaine takes place in the liver. Renal disease is unlikely to alter the kinetics of Bupivacaine to any great extent. Less than 10% of the drug is excreted unchanged in urine.

The onset of action of Bupivacaine occurs 20-30 minutes after a peripheral nerve block and duration lasts for 8-9 hours.

Clinical Applications

- Infiltration anaesthesia
- Peripheral nerve blocks
- Central neruraxial blocks (intrathecal, epidural and caudal)

Contradictions

- Para cervical block
- Known hypersensitivity to amide local anaesthetics
- Intravenous regional anaesthesia (IVRA)

Preparations available

- 0.25%, 0.5% solutions in 10 ml and 20 ml vials.
- 5mg/ml (0.5%) bupivacaine and 80 mg dextrose in 4 ml ampoules for intrathecal injection (Baricity 1.0207)

Recommended Safe Dose

Concentration Used	Maximum Permitted Dose
0.125%-0.5%	3mg/kg body weight
0.75% (not to be used in	Max.over 4 hrs-150mg

obstetric epidurals)	Max. During 24 hrs-400 mg
0.5% plain/hyperbaric solution (intrathecal use)	20 mg

Adverse Reactions

Adverse reactions are associated mainly with excess plasma levels of the drug, which may due to over dosage, unintentional intravascular injection or slow metabolic degradation.

CNS Reactions

Excitation characterized by restlessness, anxiety, dizziness, tinnitus blurred vision or tremors possibly proceeding to convulsions, followed by drowsiness, unconsciousness and cardiac arrest.

Cardiovascular System Effects

Part of the cardiac toxicity that occurs from high plasma concentrations of Bupivacaine occurs because of blockade of cardiac sodium channels. Accidental intravenous injection of Bupivacaine causes cardiac dysarrthymias, atrioventricular block, verticular tachycardia

and ventricular fibrillation. Pregnancy increases the sensitivity of cardio toxic effects of Bupivacaine.

Allergic Reactions

Manifests as urticaria, pruritus, angioneurotic edema etc. Cross sensitivity among members of amide type local anaesthetics has been reported.

With prolonged infusions there is the potential for delayed systemic accumulation and toxicity. Continuous bupivacaine infusions of up to 30 mg/hr in adults for as long as 2 weeks produced no overt CNS or cardiac toxicity despite total plasma bupivacaine concentrations in the range of 2 to 5 µg/mL in several patients.

PHARMACOLOGY OF FENTANYL[1,3,4,5]

Fentanyl is a synthetic opioid which is a phenylpiperidine derivative which acts as μ agonists. First synthesised by Paul Janssen in 1960.

Physico chemical properties

- Has a pKa of 8.4
- 84% bound to plasma proteins.
- Volume of distribution in steady state is 3 – 5 L/kg.

Opioid receptors

There are 3 receptors - μ, κ, δ. All of these are involved involved in supraspinal and spinal analgesia.

μ receptor

- Located predominantly in brain and spinal cord
- 3 subtypes - μ_1, μ_2, μ_3.
- Especially related to decreasing respiratory function, increasing sedation.

Mechanism of action:

Belong to G protein coupled receptors

↓

Activation of opioid receptor

↓

Inhibition of Adenylyl cyclase

↓

Reduced ćAMP

↓

Inhibition of voltage gated Ca^{++} channel and

Activation of K^{+} channel

↓

Reduced neuronal excitability

Pharmacokinetics

- pKa of 8.4, 10% unionised at physiological pH
- It has a half life of $t_{1/2\alpha}$ – 1–2min, $t_{1/2\beta}$ – 10–30min, $t_{1/2\gamma}$ – 2–4hrs
- 84% bound to plasma proteins
- Volume of distribution at steady state – 3-5 L/kg
- Lungs exert first pass effect by taking up 75% of fentanyl

- RBCs also take up about 40% of the drug.
- Highly lipid soluble.
- Metabolised in liver by N-dealkylation and hydroxylation, producing the metabolite Norfentanyl.

Effects on central nervous system

Dose related reduction in Cerebral blood flow and Cerebral metabolic oxygen requirements occurs.

Effects on respiratory system

- Reduction of ventilatory drive and response to pCO_2 changes
- Depresses airway reflexes blunts somatic and autonomic response to intubation
- Has antimuscarinic, antihistaminergic and antiseratoninergic actions, so more effective than morphine in patients with bronchospasm
- Respiratory depression caused by morphine is long lasing than equipotent doses of fentanyl.

Effect on cardiovascular system

- Provides hemodynamic stability throughout intraoperative period
- Stimulates central vagal nucleus and produces bradycardia. Also blockade of symphathetic response to pain is reduced due to its analgesic action.
- Fentanyl produces little or no change in myocardial contractility, but morphine reduces isometric contraction force of heart.
- Depresses baroreceptor reflex.
- Antiarrhythmogenic

  Unlike morphine, fentanyl doesnot cause histamine release

Endocrine

- Reduces release of stress response harmones – cortisol, catecholamines – and Antidiuretic harmone.
- Fentanyl is more effective than morphine in modifying harmone responses to surgery

Renal system

- Retention of urine

Gastrointestinal system

- Reduces motility
- Stimulates Chemoreceptor Trigger Zone and produces nausea and vomiting

Obstetrics and lactation

Fentanyl belongs to Category C group of drugs. However its use is allowed by American Society of Paediatrics. Although fentanyl is concentrated in breast milk, no adverse fentanyl-related effects were observed in a breastfed infant whose mother used fentanyl transdermal patches (100mcg/hour) during lactation. Though fentanyl concentrations in the mother's milk were 6.4ng/ml, blood samples from the baby were negative for fentanyl or its metabolites. Because of these reasons we preferred to use fentanyl instead of morphine in our study.

REVIEW OF LITERATURE

1. Rao V Kadam et al, 2011[5]

Conducted a study in which 20 patients were randomly allocated into two groups – Transverse Abdominis Plane group and control group. The study was conducted to evaluate the efficacy of ultrasound guided Transverse Abdominis Plane block, comparing with patient controlled analgesia with fentanyl in patients undergoing major abdominal surgeries.

Both groups were done under General anaesthesia and Transverse Abdominis Plane block was given at the end of the surgery under ultrasound guidance and an epidural catheter placed within the plane.

Transverse Abdominis Plane group received 15ml of 0.5% ropivacaine initial bolus bilaterally followed by continuous infusion of 8 – 10ml of 0.2% ropivacaine for next 72 hours. Control group did not receive any Transverse Abdominis Plane block.

Both groups were given 1g of paracetamol infusion every 6 hourly and patient controlled analgesia with fentanyl. The total requirement of fentanyl was observed. Pain scores were analysed using Numerical Rating Scale, both at rest and during movement or cough. Any episodes of nausea, vomiting, sedation and complications due to catheter placement were also noted.

Median pain scores were less in the Transverse Abdominis Plane block group when compared to control group from first post-op day onwards with a significant difference, with P values of <0.05. Mean fentanyl use was 1237±145µg in control group whereas 664±134µg in Transverse Abdominis Plane group.

Thus this study concluded that Transverse Abdominis Plane block significantly reduced the requirement of fentanyl, and the complications associated with fentanyl usage.

2. McDonnell et al, 2008[6]

They extensively carried out studies to find the efficacy of Transverse Abdominis Plane block in patients undergoing abdominal surgeries, caesarean sections and total abdominal hysterectomies.

In a prospective randomised control trial carried out on 25 parturients undergoing caesarean section, with in weight ranging from 42 – 65kg, they were randomly assigned into 2 groups – those undergoing Transverse Abdominis Plane block and those not receiving Transverse Abdominis Plane Block, but only intravenous morphine as the sole analgesic agent.

Transverse Abdominis Plane group received about 30ml of 0.25% bupivacaine and morphine was given at request while the other group received only intravenous morphine alone. VAS score, 24 hours opioid consumption and the time to first request for morphine were observed.

The mean morphine requirement was 18±14 mg in Transverse Abdominis Plane group and 66±26 mg in control

group. Time to first requirement was 220 minutes in Transverse Abdominis Plane block whereas 90 minutes in control group, with a P value of <0.001. The dosage of drug used was well within 2 mg/kg body weight, without any signs or symptoms of bupivacaine toxicity.

They proved that Transverse Abdominis Plane block significantly reduced 48 hours morphine requirement.

3. Belavy D et al, 2009[27]

Conducted a randomised, controlled trial wherein 50 patients were selected and randomised into two groups – Transverse Abdominis Plane group and PCA morphine group. These parturients underwent caesarean under subarachnoid block with heavy bupivacaine mixed with fentanyl and observed for the next 24 hours.

Pain scores, sedation, postoperative nausea and vomiting were also looked for. Mean VAS score was 10 in control group as compared to 7 in Transverse Abdominis Plane group, with significance value of 0.008. Total morphine usage was 18mg in study group as compared to

31.5 mg in control group. Fewer patients needed antiemetic in Transverse Abdominis Plane group and no local complications were reported.

4. Hyun Jun Shin et al, 2011[21]

Conducted this study in which about 32 patients were randomised into 2 groups, one undergoing Transverse Abdominis Plane block and the other not receiving this block.

Patients were operated under general anaesthesia and block performed under ultrasonogram guidance after surgery and prior to extubation. About 20ml of 0.375% ropivacaine was given bilaterally. Postoperative pain relief was given by intravenous Patient Controlled Analgesia containing ketorolac 90mg, sufentanyl 200µg and ramosetron 0.3mg in 120ml of NS totally for the first 24 hours. Fentanyl was given when pain scores were very high. Primary outcome was NRS and total analgesic requirement for the next 48 hours.

Pain scores were 3.6±2.3 at the end of 10 hours in control group whereas 2.3±2.4 in Transverse Abdominis Plane group with rest. Total analgesic requirements were 62.5±35.4µg of fentanyl in control group and 20.3±20.9µg in Transverse Abdominis Plane group.

It was concluded that Transverse Abdominis Plane block has some opioid sparing action and reduced postoperative pain. It also improved patient satisfaction when multimodal analgesic regimen used and also no serious complications were associated with this method.

5. Tery T Tan et al, 2012[23]

They hypothesised that Transverse Abdominis Plane block reduces the 24 hour morphine consumption in parturients undergoing caeserean section by general anaesthesia instead of spinal anaesthesia.

40 patients were randomly allocated into 2 groups. The study group received 20ml of levobupivacaine 2.5mg/ml bilaterally with ultrasound guidance at the end of

surgery. Control group did not receive any block and were given intravenous morphine through PCA.

They recorded the total morphine use for 24 hours, pain scores, sedation, nausea, vomiting and overall maternal satisfaction.

Results showed $P<0.01$ with the total 24 hr morphine use in study group Vs control group and higher satisfaction in mothers. No difference was detected in between VAS score, sedation or postoperative nausea and vomiting.

6. Jumaana M Baaj et al[28]

They selected a group of 40 patients and randomised them into 2 groups, 20 in each group – one with Transverse Abdominis Plane block with saline and other with Transverse Abdominis Plane block with bupivacaine.

Both groups underwent surgery under subarachnoid block with 10mg of heavy bupivacaine and 20µg of fentanyl. At end of surgery, Transverse Abdominis Plane block performed with the use of Ultrasound probe. In

control group, 20ml of saline was injected bilaterally and in study group 20ml of 0.25% bupivacaine injected bilaterally. Both received intravenous PCA morphine for 24 hours.

Thus, 24 hr morphine consumption, VAS score, patient satisfaction, PONV, and sedation were considered.

24 hours morphine consumption was significantly reduced in bupivacaine group (26±5mg) than control group (63±5mg) and VAS scores were also better in bupivacaine group. Also patient satisfaction was improved and antiemetic use reduced in Transverse Abdominis Plane with bupivacaine group.

7. Linda De Wendling, 2012[(7)]

Wrote an article based upon the personal experience of 3 physicians who were specialised in pain medicine. They underwent continuous Transverse Abdominis Plane block after caesarean section for 48 hrs and they experienced satisfactory and improved analgesia and early functional recovery. They had significantly reduced requirement of opioids.

8. Hebbard et al[16]

First described the ultrasound guided approach in 2007. He used real time ultrasound and identified the transverse abdominis plane by placing the probe over the Lower lumbar triangle of Petit. This was found to be very helpful in case of obese patients where the classical 'pop' feel of blind technique using anatomical landmarks will be misguiding or difficult to obtain

9. Peterson et al[9]

Cited about 7 randomised clinical trials in his review article where in Transverse Abdominis Plane block was given to surgery with incision below the level of umbilicus, using both blind as well as ultrasound guided method. All these proved that there was a reduction in 24hours morphine consumption and improved VAS scores. Also postoperative nausea and vomiting and sedation score related to opioid usage was significantly reduced.

10. Owen et al, 2011[23]

Conducted study on 16 cases and 18 controls undergoing caeserean section. He administered 20ml of

0,25% bupivacaine bilaterally and proved its supremacy over intravenous opioid usage.

11. Karim Mukhtar, 2009[25]

In his paper published in The Journal of New York School of Regional Anaesthesia describes in detail about the procedure of Transverse Abdominis Plane block, and about all the methods of performing it – blind technique and ultrasound guided, in detail.

12. Sukhyanthi Kerai et al, 2011[24]

They also conducted study based upon the previous studies and it was proved that Transverse Abdominis Plane block surely reduced the intake of opioids and thus extremely reduced the side effects related to opioid usage.

MATERIALS AND METHODS

This study was conducted at Institute of Obstetrics and Gynaecology, Egmore, attached to Madras Medical College, Chennai-600005, on 40 patients undergoing elective cesarean section. The study was conducted after getting Ethical committee clearance. Informed written consent was obtained from the patients included in the study.

Study Design

This was a Prospective, Randomized, Double Blinded, Case Control study. Patients were divided into 2 groups of 20 each. Only patients meeting the selection criteria were included in the study. Randomisation done by alternating patients to either Transverse Abdominis Plane group(Group T) or control group(Group C).

Group T: Undergoing bilateral continuous Transverse Abdominis Plane block.

Group C: Control group without Transverse Abdominis Plane block.

SELECTION OF CASES:

Inclusion criteria:

- Age : 18 years and above
- Weight : BMI < 30 Kg/m2
- ASA : I & II
- Surgery : Elective
- Who have given valid informed consent.

Exclusion criteria:

- Age >35yrs
- Uncontrolled PIH
- Multiple gestation
- Short stature
- Those not include in inclusion criteria
- Those with abnormal coagulation profile

MATERIALS REQUIRED:

- Full resuscitation equipment
- Patient monitoring (ECG, pulse oximeter, BP)
- Antiseptic skin preparation and sterile gloves

- Ultrasound machine with a high frequency probe (10-5 MHz)
- Ultrasound probe cover
- Ultrasound gel
- 16 G Tuohy needle with catheter set-2; 20ml syringe
- 20 to 30 ml local anaesthetic
- 2 Infusion pumps

OUTCOMES MEASURED:

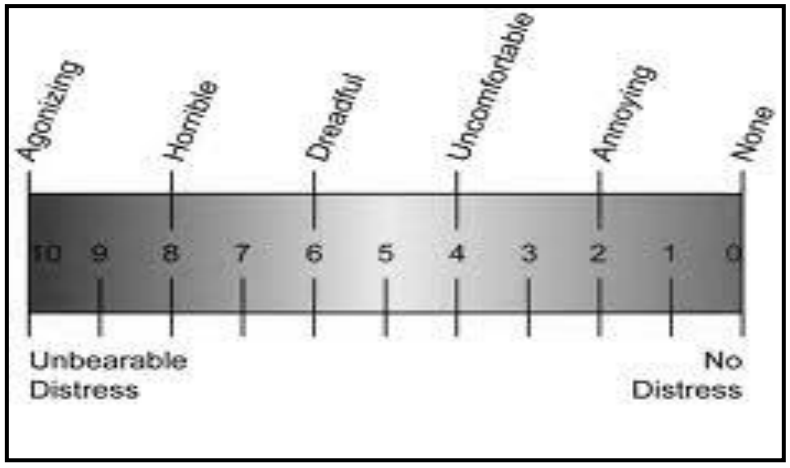
Primary:

- 48 hrs opioid consumption

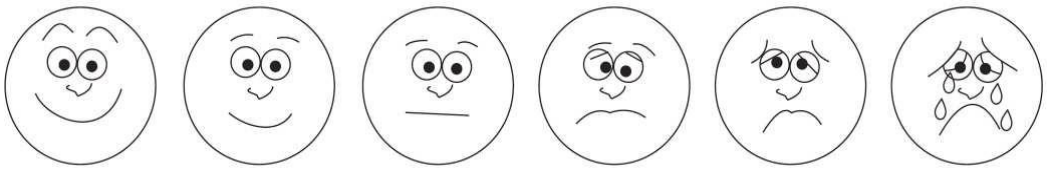
Secondary:

- Pain scores recorded on a visual analogue scale(VAS)
- PONV, sedation
- Maternal satisfaction
- Complications related to the procedure or catheter placement

ASSESSMENT OF PAIN USING VISUAL ANALOGUE SCORE



Visual Analog Scale (VAS) Score:



Very happy, no hurt. **Hurts just a little bit.** **Hurts a little more.** **Hurts even more.** **Hurts a whole lot.** **Hurts as much as you can imagine.**

0 1 2 3 4 5 6 7 8 9 10

No pain **Severe pain**

MODIFIED RAMSAY SEDATION SCORE:

Awake levels

1. Anxious, agitated or both
2. Co-operative oriented, tranquil
3. Response to commands only

Asleep levels

1. Brisk response to loud auditory stimulus
2. Sluggish response to loud auditory stimulus
3. No response to loud auditory stimulus

STUDY METHOD:

- All patients were assessed in our pre-anesthetic clinic. Patients with exclusion criteria were excluded. After getting informed consent, patients who satisfied our inclusion criteria were taken under our study.
- Patients were divided into 2 groups of 20 each. Randomisation was done by alternating patients to either Transverse Abdominis Plane group (Group T) or control group (Group C).
  - **Group T:** Undergoing bilateral continuous Transverse Abdominis Plane block
  - **Group C:** Control group without Transverse Abdominis Plane block.
- Inside the operation theatre, all basic monitors were connected (ECG, NIBP, SpO_2, temperature monitoring). All basal parameters were noted.
- Patient was given subarachnoid block under sterile aseptic precautions and monitored intraoperatively.
- For Group T, Transverse Abdominis Plane block was done at end of surgery.

PROCEDURE:

- Patient in supine position, ultrasound probe placed transverse to the abdominal wall between costal margin and iliac crest
- Transverse abdominis plane reached using 16G Tuohy's needle with bevel facing superiorly
- Correct placement of needle tip confirmed by injecting 5 – 10 ml saline Bolus dose of 15ml of 0.25% bupivacaine administered.
- Epidural catheter advanced cephalad up to 10cm (normal) - 15cm(obese) mark.
- Needle removed and catheter connected to a bacterial filter.
- Procedure repeated on opposite side.
- Continuous infusion at the rate of 8-10ml/hr for 72 hrs on each side.
- In control group, patients did not receive any Transverse Abdominis Plane block
- Standard Non steroidal anti inflammatory agents were given every 8hrly in both groups.
- Both received intravenous opioid Fentanyl on demand as intermittent boluses.

Post operatively patient monitored in NPO ward. Various parameters like HR, Blood pressure (both systolic and diastolic), SPo2, Visual Analogue Scale (VAS) and Ramsay Sedation Score (RSS) were observed for 24 hours post operatively. Incidences of side effects were also noted. Injection Tramadol 50mg IV was used as rescue analgesia when pain score was more than 4 (i.e. VAS ≥4).

STATISTICAL ANALYSIS:

Data were analysed using SSPS, WINDOWS VERSION 15.Two sided independent student's t tests to analyse continuous (quantitative) data, Fisher's exact test and chi-square test for categorical (qualitative) data were used. *Pvalue*<0.05 was considered as statistically significant.

DEMOGRAPHIC DATA:

The two groups were compared with respect to their age, weight, and ASA status.

STATISTICS:

Statistical analysis:

DESIGN

This was a Prospective, Randomized, Double Blinded, Case Control study. Patients were divided into 2 groups of 20 each. Only patients meeting the selection criteria were included in the study. Randomization done by alternating patients to either Transverse Abdominis Plane group (Group T) or control group (Group C).

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Data obtained were analysed using SSPS, WINDOWS VERSION 15. Two sided independent student's t tests to analyse continuous (quantitative) data, Fisher's exact test and chi-square test for categorical data (qualitative) were used. $P<0.05$ was considered as statistically significant.

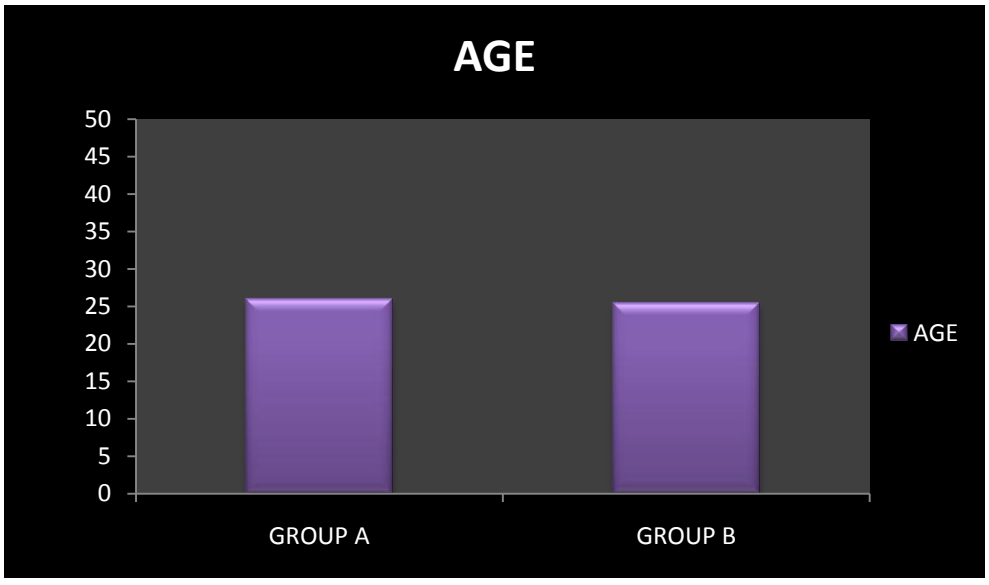
Both groups were compared with respect to their age, weight, baseline systolic blood pressure , diastolic blood pressure, mean blood pressure, and heart rate. The level at the time of performing block, VAS scores over 48 hrs, the time for first requirement of fentanyl, total fentanyl consumption were noted and compared.

OBSERVATIONS AND RESULTS

1. Demographic profile: AGE (in years):

Group	Number	Mean(yrs)	SD
T	20	25.94	4.531
C	20	25.50	3.687
P value	**0.734 (Not Significant)**		

The mean age in group T was 25.94 and in group C was 25.50. p value was 0.734, which was not statistically significant. Both groups were comparable in terms of age.



2. Demographic profile: WEIGHT (in kg):

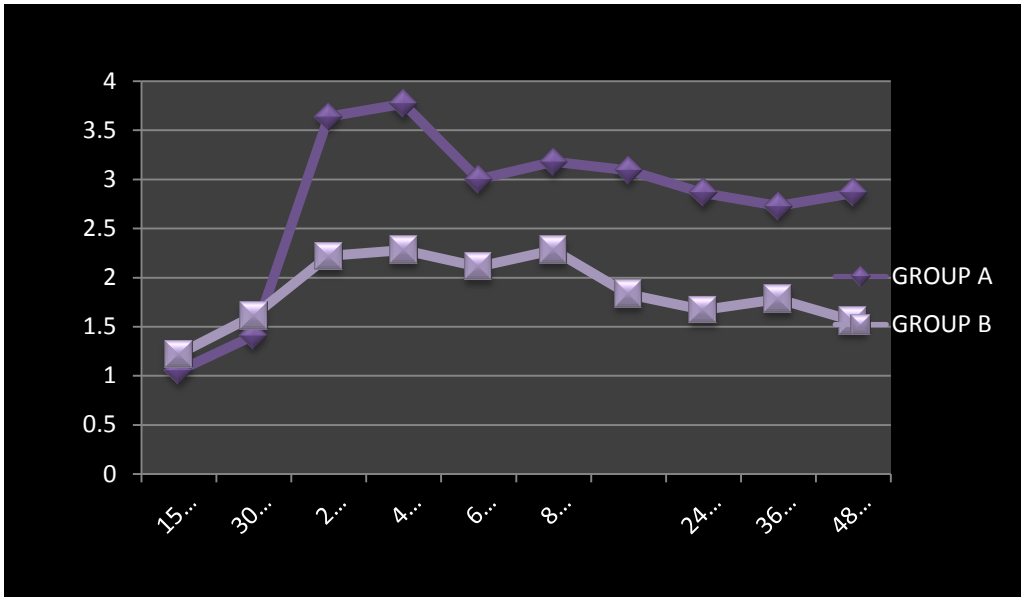
Group	No	Mean(kg)	SD
A	20	55.56	5.338
B	20	54.82	4.876
P value	**0.651 (Not Significant)**		

Weight of the patients in group T hed mean value of 55.56 and standard deviation of 5.34. In group C, mean value was 54.82 and standard deviation 4.88. The p value was 0.65, it was not statistically significant. Both groups were comparable in terms of weight.

3. VAS SCORE:

VAS score	Group–C Mean ± sd	Group-T Mean ± sd	p-Value df=58
15 min	1.05 ± 0.21	1.22 ± 0.55	0.172*
30 min	1.41 ± 0.55	1.61 ± 0.92	0.382*
2 hrs	3.64 ± 0.90	2.22 ± 0.81	0.000
4 hrs	3.77 ± 0.69	2.28 ± 0.83	0.000
6 hrs	3.00 ± 0.76	2.11 ± 0.83	0.001
8 hrs	3.18 ± 0.73	2.28 ± 0.58	0.000
12 hrs	3.09 ± 0.69	1.83 ± 0.71	0.000
24 hrs	2.86 ± 0.71	1.67 ± 0.49	0.000
36 hrs	2.73 ± 0.55	1.78 ± 0.68	0.000
48 hrs	2.86 ± 0.71	1.56 ± 0.62	0.000

*** Not Significant**



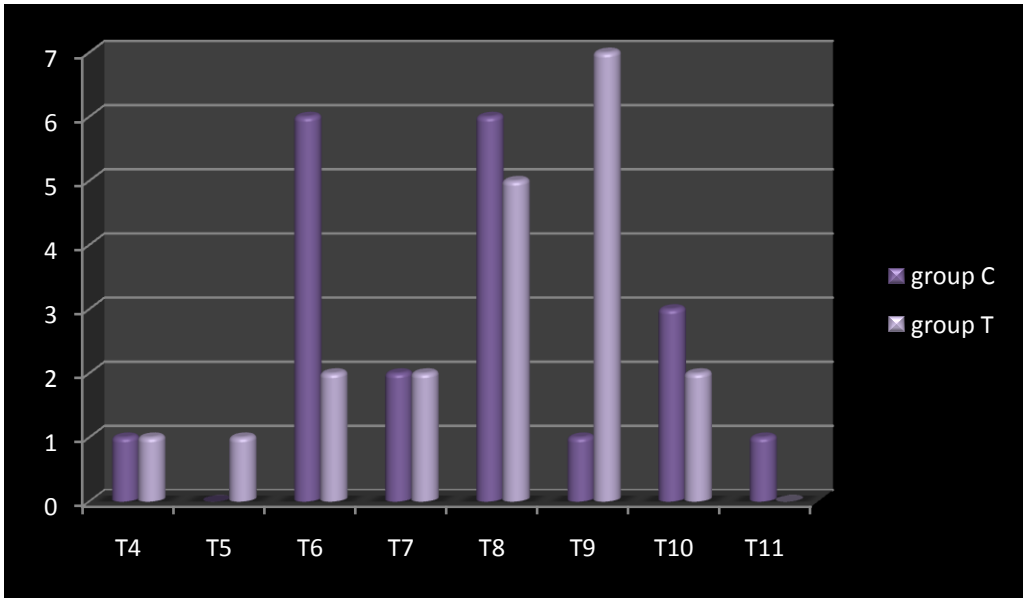
VAS scores were significantly lower in Transverse Abdominis Plane group than in control group. There was no difference in pain score at 0, 15 and 30minutes and was found to be statistically not significant ($p>0.05$).

At end of 24th hr, the mean VAS score in Transverse Abdominis Plane group was 1.67±0.485 and in Control group was 2.86±0.774; there was statistical significant difference in both groups ($p<0.000$)

At 48 hours, the mean VAS score in Transverse Abdominis Plane group was 1.56±0.616 and in Control group was 2.86±0.710 and was also found to be statistically significant ($p<0.000$).

4. SENSORY LEVEL OF BLOCKADE (dermatome):

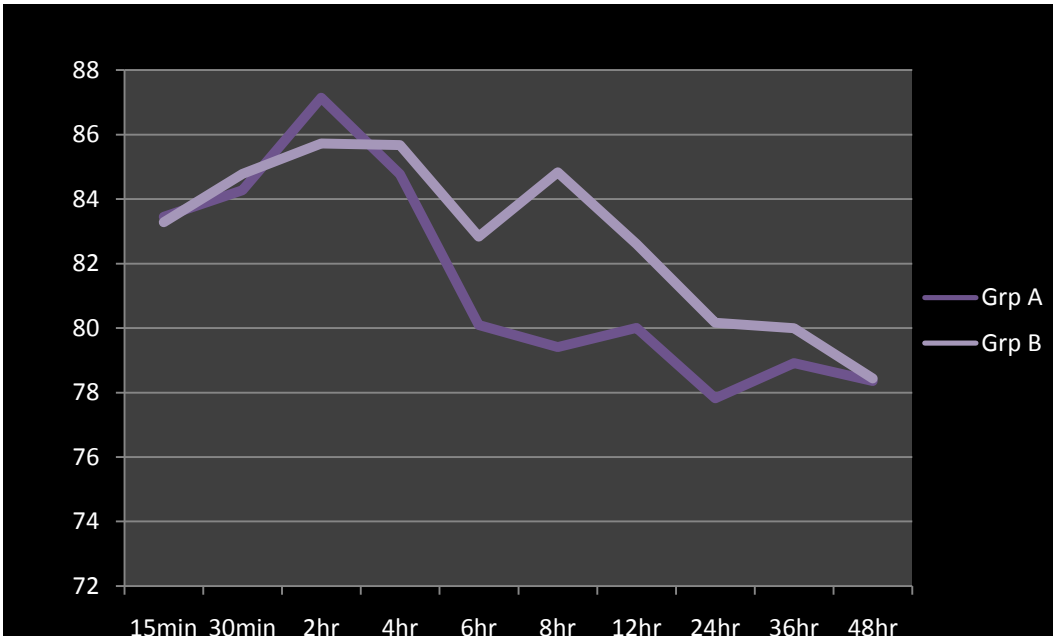
GROUP	T4	T5	T6	T7	T8	T9	T10	T11
A	1	0	6	2	6	1	3	1
B	1	1	2	2	5	7	2	0



5. HEART RATE:

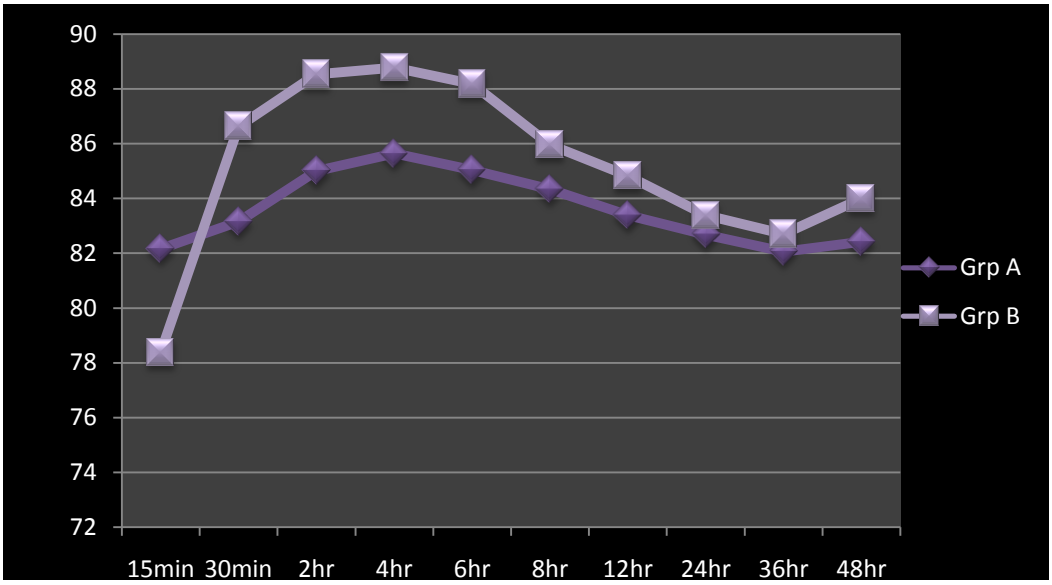
TIME	GROUP	N	MEAN (per min)	STD. DEV	P VALUE
HR_15m	Control	20	83.45	12.312	0.963
	Study	20	83.28	11.103	
HR_30m	Control	20	84.27	12.456	0.886
	Study	20	84.78	8.928	

HR_2h	Control	20	87.14	10.366	0.669
	Study	20	85.72	10.249	
HR_4h	Control	20	84.77	10.547	0.773
	Study	20	85.67	8.458	
HR_6h	Control	20	80.09	9.961	0.324
	Study	20	82.83	6.653	
HR_8h	Control	20	79.41	8.330	0.048
	Study	20	84.83	8.382	
HR_12h	Control	20	80.00	6.332	0.235
	Study	20	82.61	7.342	
HR_24h	Control	20	77.82	8.238	0.374
	Study	20	80.17	8.176	
HR_36h	Control	20	78.91	8.847	0.668
	Study	20	80.00	6.642	
HR_48h	Control	20	78.36	6.870	0.970
	Study	20	78.44	6.428	



6. MEAN ARTERIAL PRESSURE:

TIME	GROUP	N	MEAN (mm Hg)	STD.DEV	P VALUE
MAP_15m	Control	20	82.1667	7.30568	0.197
	Study	20	78.3889	10.83582	
MAP_30m	Control	20	83.1515	6.59383	0.187
	Study	20	86.6296	9.71616	
MAP_2h	Control	20	85.0000	8.08814	0.194
	Study	20	88.5370	8.81557	
MAP_4h	Control	20	85.6364	8.93889	0.315
	Study	20	88.7778	10.57374	
MAP_6h	Control	20	85.0303	8.95072	0.283
	Study	20	88.1852	9.29630	
MAP_8h	Control	20	84.3333	7.38295	0.487
	Study	20	85.9630	7.21100	
MAP_12h	Control	20	83.3939	7.52466	0.572
	Study	20	84.8333	8.44223	
MAP_24h	Control	20	82.6818	7.02714	0.746
	Study	20	83.3889	6.56217	
MAP_36h	Control	20	82.0606	6.05411	0.751
	Study	20	82.7037	6.63807	
MAP_48h	Control	20	82.4242	6.24896	0.424
	Study	20	84.0000	6.00218	

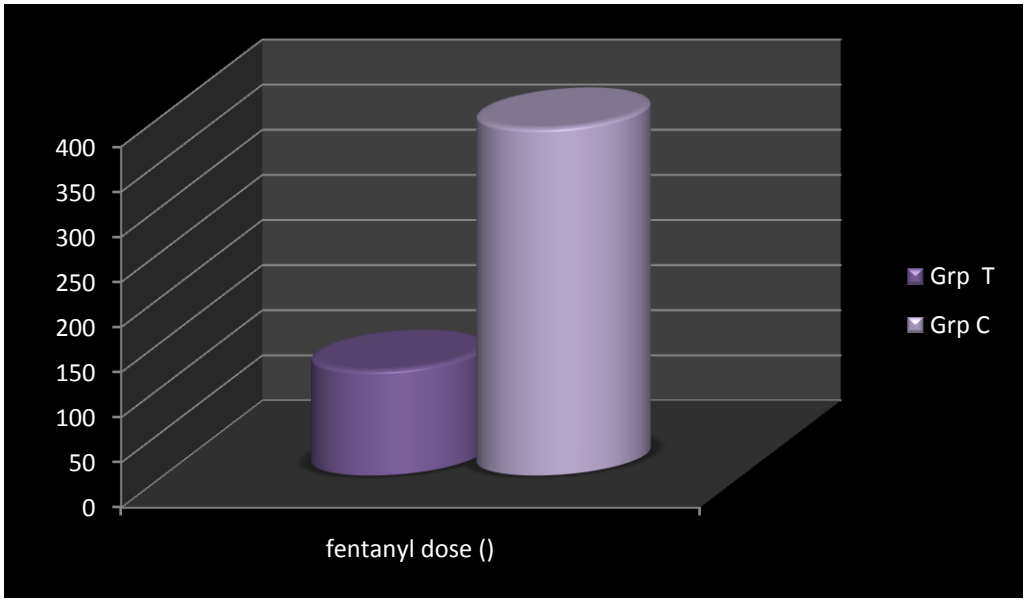


There was no significance in heart rate and also mean blood pressure of both groups. Also the intervariability was insignificant.

7. TOTAL FENTANYL REQUIREMENT:

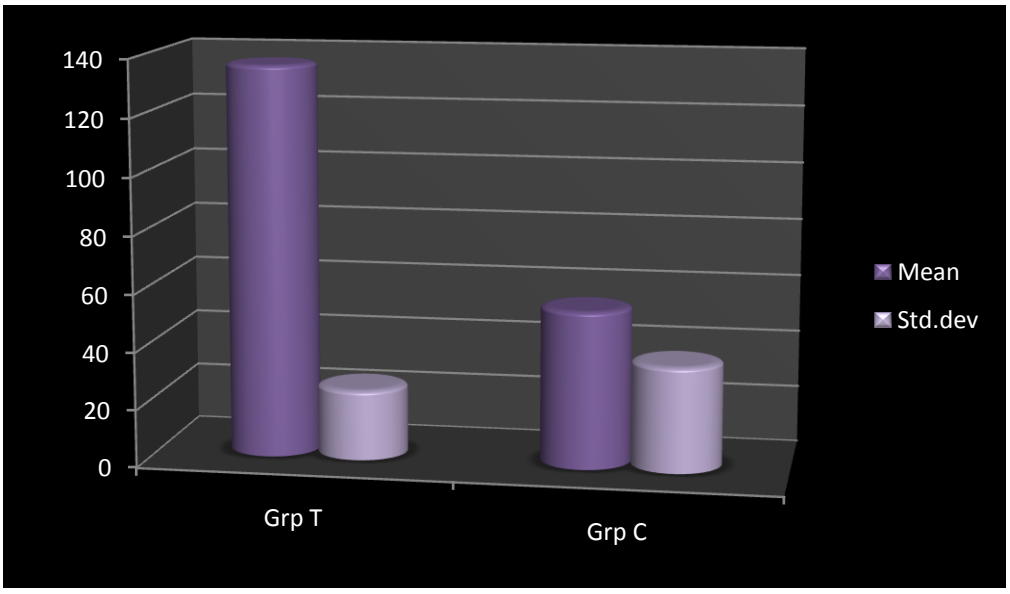
GROUP	N	MEAN(µg)	STD.DEV	P VALUE
GROUP C	20	384.77	105.351	0.000
GROUP T	20	116.67	32.084	

The total 48 hours Fentanyl consumption in Group C was 384.77±105.35 µg, where as in Group T it was 116.67±32 µg, with P value of < 0.000, which was statistically highly significant.



8. TIMING OF FIRST DOSE:

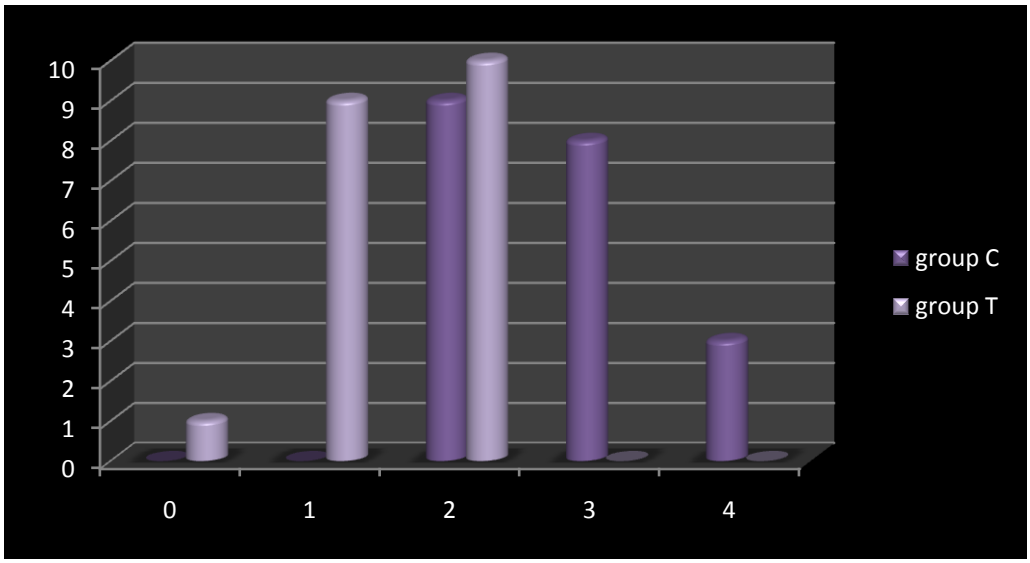
GROUP	N	MEAN ± STD.DEV(MIN)
CONTROL	20	54.77 ± 36.76
STUDY	20	136.4 ± 24.54
P value	0.000	



The time for requirement of first analgesic dose was significantly prolonged with the use of TAP block. The mean time for requirement was 55±37 mins in Group C, where is prolonged to 136±25 mins in Group T. P value was <0.000.

9. SEDATION (modified Ramsay sedation score):

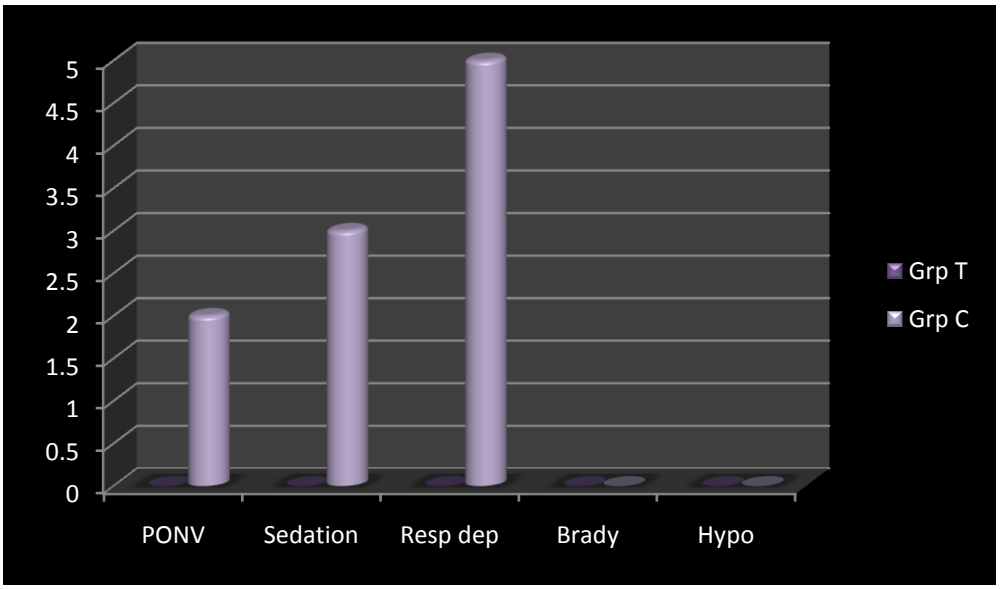
SEDATION	0	1	2	3	4
Grp T	1	9	10	0	0
Grp C	0	0	9	8	3
P value	0.000 (significant)				



High sedation scores were seen in study group, whereas alertness was maintained in the Transverse Abdominis Plane group.

10. SIDE EFFECTS

Side effects	Group T	Group C
Bradycardia	0	0
Sedation(>3)	0	3
Respiratory depr	0	5
Nausea&Vomiting	0	2
Hypotension	0	0



None of the patients in Group T developed any side effects. P value was 0.000, which was highly statistically significant. In Group C, 2 patients developed vomiting, 5 patients developed respiratory depression (defined as respiratory rate <12/minute)

DISCUSSION

The role of Transverse Abdominis Plane Block in major abdominal surgeries is not fully defined. So our study demonstrates its probable efficacy in patients undergoing lower segment caesarean section who have a below umbilicus pfannensteil incision, in terms of reducing pain scores and opioid usage for the first 48 hours. The posterior approach described by **Hebbard et al**[16] was followed in our study.

Technical problems encountered in our study were

- Difficulty to hold the transducer probe
- Use of large volume of saline to confirm space
- Leakage of local anaesthetic solution through the wound site
- Soiling of the dressing
- Chances of dislodgment of catheter.

This was prevented by getting help of an assistant and correct visualisation of tip of the needle. Other problems were partly by subcutaneous tunnelling.

In our study, the demographic profile was comparable with respect to mean age, body weight and ASA physical status. We did bilateral Transverse Abdominis Plane block in the group T and gave 15 to 20 ml of 0.25% bupivacaine according to the patient weight and continuous infusion on both sides were started at 10 ml/ hr of 0.125% bupivacaine. They received the usual doses of NSAIDS 8 hourly and were given fentanyl on demand whenever patient complained of pain. The pain scores and the total requirement of fentanyl of both groups were observed.

Pain scores

Results of our study showed that Transverse Abdominis Plane block, significantly reduced VAS scores over 48hour period. Though the initial 2hours produced similar scores, corresponding to the period of wearing off of spinal analgesia, the scores were significantly reduced

since the second hour postoperatively. This finding was correlating with studies done by

1. Rao et al[5] did study of patients undergoing major abdominal surgeries under general anaesthesia and performed Transverse Abdominis Plane Block in these patients. His study observed that pain scores were insignificant at 0 hours and 1st hours after surgery. Pain was significantly less on day1, on cough; day2, both on coughing and on rest and insignificant scores followed on day 3.

2. Teny T Tan et al[23] who also conducted studies on patients undergoing caesarean section under general anaesthesia and Transverse Abdominis Plane block given at end of surgery. They did not do this block under ultrasound guidance. Although there was a reduction in the scores, they detected no significance in VAS scores in their study.

3. McDonnell et al[6] reported a significant reduction in VAS score over 48 hrs. They conducted study in which the

patients received spinal anaesthesia for caesarean section. Their study differed from ours in that they used ropivacaine instead of bupivacaine and morphine instead of fentanyl. At some points however the VAS scores was lower in study group.

4. Hyun Jung Shin et al[21] used 0.375% ropivacaine in single shot Transverse Abdominis Plane block for patients undergoing gynaecological surgeries through below umbilicus transverse incision. Intravenous pethidine and fentanyl were used through PCA method. Over the next 48 hours they observed a P value of <0.05 in Transverse Abdominis Plane group as compared with control group.

5. Belavy D et al[27] observed no significant changes in the VAS scores in their study. Their study differed from ours in that they received fentanyl 15μg along with 0.5% hyperbaric bupivacaine for subarachnoid blocks. Regularly paracetamol 1g was given 4 hourly along with ibuprofen 400mg tds and PCA morphine given. It was however observed that their patients were able to mobilize within 24 hrs postoperatively.

6. Borglum et al[9] demonstrated effective pain management and thus quicker mobilisation and discharge from PACU in their study on patients undergoing major abdominal surgeries who were given bilateral 4 pointed Transverse Abdominis Plane block.

48 Hour Fentanyl Consumption:

In our study we found out that the total opioid consumption over 48 hours was significant statistically. In controls, the mean requirement was 384.77±105.35µg whereas it was 116.67±32.08µg in case of Transverse Abdominis Plane block group. P value was about 0.000. This finding was consistent with the following studies.

1. Rao et al[5] showed significant difference at 1st hour and on postoperative day 1 and 2 (control – 1237±146; Transverse Abdominis Plane – 664 ± 134µg on day 1), whereas it was insignificant on day 3(control – 661±237; Transverse Abdominis Plane – 609±161µg).

2. Teny T Tan et al[23] observed a significant reduction in morphine usage for the initial 24 hours. Whose mean values

were 31.4±3.1mg in control whereas 12.3±2.6mg in Transverse Abdominis Plane group, with a P value of <0.001.

3. Bharthi et al[23] showed a significant reduction of 24 hour morphine consumption; in controls the mean was 17.55 ± 5.78 mg and in TRANSVERSE ABDOMINIS PLANE group it was 6.45±3.26mg with P value of <0.0001.

4. Hivelin et al[23] demonstrated that the morphine requirement was in the range of 36 – 46mg in control group whereas 27 – 38 mg in study group. The P value was <0.0057. their study differed in that they observed the patients only for initial 24hrs.

5. There was no significant difference in 24 hr opioid consumption in the study by **Griffith et al**[23] where he performed ultrasound guided Transverse Abdominis Plane blocks with ropivacaine and saline. They concluded that the high incidence of obesity in their study group and thus

technical failures might have lead to such a negative observation.

6. Baaj et al[23] observed a significant(P value < 0.05%) reduction in 24 hr morphine consumption. Their control group received Transverse Abdominis Plane block with saline whereas the study group received bupivacaine. The morphine requirements were 63±5mg in saline group and 26±5mg in bupivacaine group.

7. Mc Donnell et al[6], who conducted study over patients undergoing caesarean receiving Transverse Abdominis Plane block compared with placebo, the 48 hr morphine requirement was 66±26mg in control Vs 18±14mg Transverse Abdominis Plane group who received ropivacaine.

8. The study conduted by **Belavy et al**[27] noted the total amount of morphine used over 24hrs. Placebo group had a mean morphine need of 31.5mg which was significant statistically as morphine requirement was 18mg in study group.

9. Hyun Jung Shin et al[21] did ultrasound guided TRANSVERSE ABDOMINIS PLANE block in patients undergoing gynaecological surgeries under general anaesthesia and concluded that this block reduced fentanyl requirement from 62.5±35µg in control to 20.3±20.9µg in study group.

Time to rescue analgesia:

Our study demonstrated a significant reduction in the first dose timing of fentanyl in the study group. Control group took about a mean of 55minutes whereas 135 min in Transverse Abdominis Plane block group with P value <0.000.

Belavy et al[27] observed that time for the first demand of analgesia was 3hrs in Transverse Abdominis Plane group whereas 2hrs in control group. No other study group patients were having complications related to the procedure and were well satisfied.

Side effects – PONV, Sedation, Pruritis, Respiratory depression:

The incidence of postoperative nausea and vomiting was absent in the study group while two cases in the control group had PONV. We also noted that about 5 patients had mild decrease in respiratory rate in control group. There was no pruritis in both groups. Sedation scores at the end of 48 hours was found to be high in control group than in Transverse Abdominis Plane group.

Though **McDonnell et al**[6] observed no significant changes in incidence of postoperative nausea and vomiting, there was significance in sedation scores of both groups wherein they found about 36% incidence in the controls whereas it was nil in Transverse Abdominis Plane group. Thus maternal satisfaction was better in the Transverse Abdominis Plane group. The trial conducted by **Belavy et al**[27] showed significant reduction in PONV in Transverse Abdominis Plane group, but pruritis and sedation cores were similar in both groups**. Tery Tan et al**[23] showed that their results had no changes in incidence of sedation and no respiratory depression was found**. Katrina et al** reported

nil vomiting and complications pertaining to catheter placement. Another case report also noted absence of PONV in TRANSVERSE ABDOMINIS PLANE given patients. Also **Jumana et al**[28] also reported fewer incidences of nausea and vomiting.

SUMMARY

Transverse Abdominis Plane block is an efficient and safe adjuvant to multimodal postoperative analgesia in abdominal surgeries, especially with incisions below umblicus. Patients who are contraindicated for long acting or highly sensitive to opioids can receive this block as an adjuvant to the usual analgesic regimen for greater comfort. Coagulation profile is an area of uncertainity which requires further studies to prove its efficacy. Also there are no major neurovascular structures near the area of block which is of great advantage.

Some studies have reported complications of Transverse Abdominis Plane block. One case was diagnosed with hemoperitoneum following liver trauma due to subcostal block. Another study reported large intestinal puncture and hematoma following Transverse Abdominis Plane block. Also there occured intraperitoneal injections, transient femoral nerve palsy. Use of Ultrasound certainly minimises these complications.

The physiological changes following epidural analgesia due to sympathetic blockade is completely absent in Transverse Abdominis Plane block. The advantages of epidural, like – reduction in incidence of thromboembolism, postoperative pneumonia, intra operative blood loss, reduced stress response and stress induced immunosuppression – are not proved to be with the use of Transverse Abdominis Plane block. So Transverse Abdominis Plane block is superior in use as a supplement to multimodal postoperative analgesia and in reducing total opioid consumption.

CONCLUSION

Thus Transverse Abdominis Plane block can be used in cases where in central neuro axial blockade is contraindicated. However only somatic pain can be blocked with this technique and fentanyl is required to block visceral pain. So it can be used as an adjuvant to multimodal method of analgesia, thereby reducing the total requirement of opioid and its adverse effects.

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INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI -3

Telephone No : 044 25305301
Fax : 044 25363970

CERTIFICATE OF APPROVAL

To
Dr.D.Divya,,
PG in M.D.Anaesthesiology
Madras Medical College & Govt. General Hospital,
Chennai -3

Dear Dr.D.Divya,

The Institutional Ethics committee of Madras Medical College, reviewed and discussed your application for approval of the proposal entitled " Prespective randomised control study for evaluating the efficacy of ultrasound guided continuous transverse abdominis plane block in patients undergoing lower segment caeserian section, for postoperative analgesia" No.16112012.

The following members of Ethics Committee were present in the meeting held on 01.11.2012 conducted at Madras Medical College, Chennai -3.

1. Prof. R. Nandhini MD -- Member Secretary
   Director, Instt. of Pharmacology ,MMC, Ch-3
2. Prof. Reghu MD -- Member
   Director , Inst. Of Internal Medicine, MMC, Ch-3
3. Prof. Shyamraj MD -- Member
   Director i/c , Instt. of Biochemistry , MMC, Ch-3
4. Prof. P. Karkuzhali. MD -- Member
   Prof., Instt. of Pathology, MMC, Ch-3
5. Prof. G.Muralidharan MS -- Member
   Prof of Surgery, MMC, Ch-3
6. Thiru. S. Govindsamy. BA, BL -- Lawyer

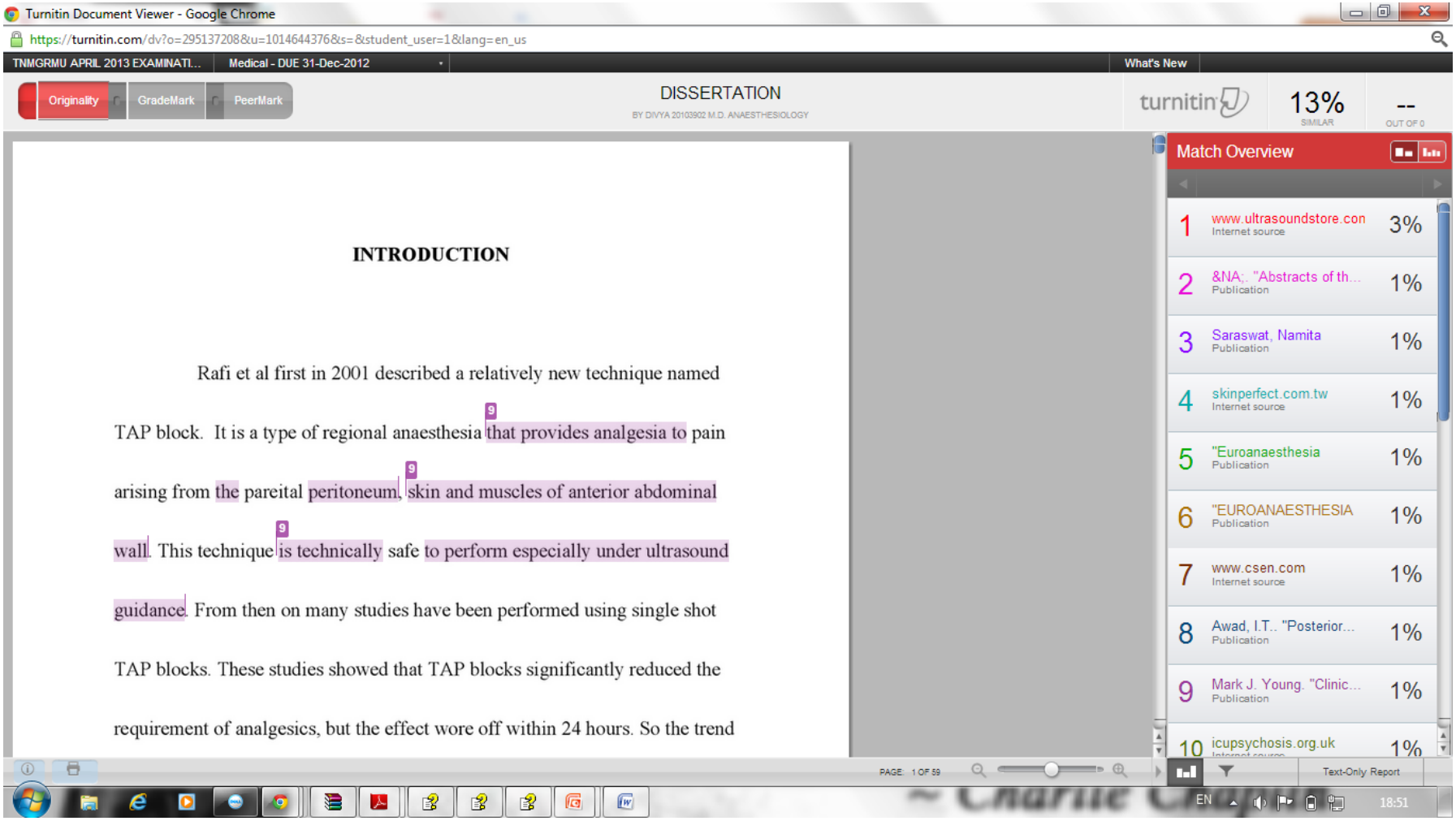
We approve the proposal to be conducted in its presented form.

Sd/ Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, and SAE occurring in the course of the study, any changes in the protocol and patients information / informed consent and asks to be provided a copy of the final report.

R Nadini 19/11/12
Member Secretary, Ethics Committee

ANTIPLAGARISM SCREEN SHOT



PATIENT CONSENT FORM

Study Title: Prospective randomised control study for evaluating the efficacy of ultrasound guided continuous transverse abdominis plane block in patients undergoing lower segment caesarean section for postoperative analgesia.

Study centre: Department of Anaesthesiology,
Institute of Obstetrics and Gynaecology,
Chennai

Participant name:

Age/Sex:

I.P.No:

I confirm that I have understood the purpose of procedure for the above study. I have the opportunity to ask the question and all my questions and doubts have been answered to my satisfaction.

I have been explained about the pitfall in the procedure. I have been explained about the safety, advantage and disadvantage of the technique.

I understand that my participation in the study is voluntary and that I am free to withdraw at anytime without giving any reason.

I understand that investigator, regulatory authorities and the ethics committee will not need my permission to look at my health records both in respect to current study and any further research that may be conducted in relation to it, even if I withdraw from the study. I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from the study.

Time:

Date:

Signature / Thumb impression of patient

Place: Patient Name

Signature of the investigator:

Name of the investigator:

INFORMATION TO THE PARTICIPANTS

INVESTIGATOR:

NAME OF PARTICIPANT:

TITLE:

You are invited to take part in this research study. We have got approval from the ethical committee. You are asked to participate because you satisfy the eligibility criteria. We want to study the efficacy of ultrasound guided continuous TAP block for cesarean section, as postoperative analgesia.

PURPOSE OF THE STUDY:

The requirement of fentanyl for postoperative analgesia is high following cesarean sections. This study evaluates the efficacy of TAP block to reduce the postoperative requirements of morphine.

THE STUDY DESIGN:

All the patients in this study will be divided into two groups. At the end of surgery,

Group A: Receive ultrasound guided bilateral TAP block, with 0.25% bupivacaine

Group B: No TAP block and followed by intravenous fentanyl on demand.

All these patients are shifted to postoperative ward for observation and postoperative pain relief management.

BENEFITS:

- Total fentanyl consumption is reduced and thus its side effects like nausea, vomiting, sedation, pruritis are reduced.
- Better patient satisfaction.

Time:

Date:

Signature / thumb impression of the patient

Place:

Signature of investigator: Patient Name

Name of the investigator:

PROFORMA

Name: Age: Sex:

Weight: IP.No:

Diagnosis:

Procedure:

Anaesthetic Plan: ASA

Level of blockade at the end of surgery:

Time	BP	Pulse	SpO_2	VAS	Side Effects
15 mins					
30 mins					
2 hrs					
4 hrs					
6 hrs					
8 hrs					
12 hrs					
24 hrs					
36 hrs					
48 hrs					

Rescue Analgesia:

Time of Requirement	Dose of Fentanyl

MASTER CHART

GROUP T – TRANSVERSE ABDOMINIS PLANE BLOCK																	
S No	Name	Age	Weight	Diagnosis	ASA	Group	Level of Blockade At End of Surgery	VAS SCORE									
								15 min	30 min	2 hrs	4 hrs	6 hrs	8 hrs	12 hrs	24 hrs	36hrs	48 hrs
1	Arthi	23	62	PREV LSCS	2	1	T8	1	1	3	1	1	2	2	2	1	1
2	Sathya	22	51	PREV LSCS	2	1	T6	1	1	3	2	2	3	3	2	2	2
3	Devi	26	58	CPD 2, POSTDATED	2	1	T6	1	1	2	3	2	2	1	2	1	2
4	Abirami	21	52	CPD 1, FAILED ACCELERATION	2	1	T8	1	1	2	3	2	2	1	1	2	1
5	Hemapriya	23	50	PREV LSCS	2	1	T7	1	2	2	1	1	2	1	2	1	1
6	Velva	30	59	CPD IN LABOUR	2	1	T10	2	3	2	2	1	2	2	1	2	1
7	Kavitha	29	65	BOH	2	1	T8	1	1	3	2	3	4	2	2	2	2
8	Jeyanthi	22	58	PREV LSCS, CPD	2	1	T10	2	3	1	2	4	3	2	2	1	1
9	Jothi	28	50	PREV 2 LSCS	2	1	T11	3	4	2	3	2	3	2	1	2	3
10	Durga	21	54	PRIMI, POSDATED	2	1	T6	1	1	1	3	2	2	2	1	2	2
11	Velvizhi	32	60	PREV LSCS	2	1	T9	1	2	1	1	2	2	3	2	1	1
12	Rukmani	35	60	ELDERLY PRIMI, FI	2	1	T6	1	1	2	2	3	2	1	1	2	1
13	Sathya	21	48	FAILED INDUCTION	2	1	T8	1	2	2	2	1	2	1	2	1	1
14	Latha Ramesh	26	52	PRIMI,CPD IN LABOUR	2	1	T8	1	1	3	2	2	2	1	1	2	1
15	Jennifer	21	63	PRIMI, BREECH	2	1	T6	1	1	2	4	3	2	2	2	3	2
16	Revathy	33	50	SEVERE OLIGOHYDRAMNIOS	2	1	T8	1	2	4	3	2	2	3	2	2	2
17	Devi	26	58	PREV LSCS	2	1	T4	1	1	2	3	2	2	2	2	3	2
18	Annapoorani	28	50	PRIMI BREECH	2	1	T7	1	1	3	2	3	2	2	2	2	2
19	Dhanalakshmi	32	50	PRIMI, CPD, FETAL DISTRESS	2	2	T10	2	2	3	5	4	3	3	2	3	3
20	Divya	22	60	PREV LSCS	2	2	T6	1	1	4	3	2	3	3	2	2	2

GROUP C – NO TAP BLOCK																	
S No	Name	Age	Weight	Diagnosis	ASA	Group	Level of Blockade At End of Surgery	VAS SCORE 15 min	30 min	2 hrs	4 hrs	6 hrs	8 hrs	12 hrs	24 hrs	36hrs	48 hrs
21	Gomathi	26	66	CPD, PLACENTA PRAEVIA	3	2	T9	1	2	4	3	3	2	2	3	4	3
22	Devi	25	54	PRIMI, MSL	2	2	T9	1	1	3	3	2	4	2	2	2	2
23	Girija	25	60	PREV LSCS	2	2	T7	1	1	4	3	2	3	3	2	2	3
24	Manimegalai	22	60	CPD IN LABOUR	2	2	T8	1	1	3	4	3	2	2	3	2	3
25	Sangeetha	20	52	PREV LSCS,	2	2	T10	1	2	4	3	3	3	3	2	3	2
26	Sathya	25	48	PRIMI, MSL	2	2	T9	1	2	3	3	2	2	2	2	2	2
27	Eromiya	24	56	CPD, BICORNUATE UTERUS	2	2	T4	1	1	2	4	2	2	3	2	2	2
28	Nagammal	23	50	PRIMI, BREECH	2	2	T7	1	2	4	3	3	4	3	3	3	3
29	Nithya	25	50	PREV LSCS, MSL	2	2	T8	1	1	3	4	3	4	4	3	3	3
30	Lakshmi	32	55	PRIMI, CPD	2	2	T6	1	1	3	5	4	4	3	4	3	3
31	Ramya	21	50	FAILED INDUCTION	2	2	T8	1	1	5	4	4	3	3	4	3	4
32	Ramya	25	55	PREV LSCS	2	2	T9	1	2	4	4	3	4	4	3	3	3
33	Shakila	23	50	PREV LSCS	2	2	T10	1	2	5	4	3	4	4	3	3	4
34	Poongavanam	28	58	PREV LSCS	2	2	T9	1	1	4	3	4	3	3	3	3	3
35	Sargunam	35	50	ELDERLY PRIMI, MSL	2	2	T6	1	1	5	4	3	4	4	3	3	4
36	Asha	25	60	PREV LSCS	2	2	T5	1	1	2	4	3	4	3	4	3	3
37	Priya	23	60	PRIMI, FAILED IND	2	2	T9	1	2	4	5	4	3	4	4	3	4
38	Rani	28	50	PRIMI, FD	2	2	T8	1	1	3	4	4	3	3	4	3	2
39	Magdalin Mary	26	54	PREV LSCS	2	2	T8	1	1	3	4	2	3	3	2	2	3
40	Datchayini	26	58	PREV LSCS	2	2	T9	1	2	5	4	3	3	4	3	3	2

GROUP T – TRANSVERSE ABDOMINIS PLANE BLOCK										
S No	Name	Age	RESCUE ANALGESIA		SIDE EFFECTS					
			Total Dose- Fentanyl (μg)	Timing of First Dose (mins)	PONV	BRADY	RESP DEP	Pruritis	Sedation at end of 48 hrs	Hypotension
1	Arthi	23	100	120	0	0	0	0	2	0
2	Sathya	22	125	180	0	0	0	0	2	0
3	Devi	26	150	100	0	0	0	0	1	0
4	Abirami	21	150	120	0	0	0	0	2	0
5	Hemapriya	23	175	120	0	0	0	0	1	0
6	Velva	30	75	145	0	0	0	0	2	0
7	Kavitha	29	100	160	0	0	0	0	3	0
8	Jeyanthi	22	100	160	0	0	0	0	0	0
9	Jothi	28	100	140	0	0	0	0	1	0
10	Durga	21	125	100	0	0	0	0	2	0
11	Velvizhi	32	100	120	0	0	0	0	2	0
12	Rukmani	35	125	140	0	0	0	0	2	0
13	Sathya	21	175	165	0	0	0	0	1	0
14	Latha Ramesh	26	150	140	0	0	0	0	1	0
15	Jennifer	21	100	125	0	0	0	0	2	0
16	Revathy	33	75	120	0	0	0	0	1	0
17	Devi	26	75	120	0	0	0	0	2	0
18	Annapoorani	28	100	180	0	0	0	0	1	0
19	Dhanalakshmi	32	125	180	0	0	0	0	2	0
20	Divya	22	100	120	0	0	0	0	1	0

GROUP C – NO TAP BLOCK										
S No	Name	Age	RESCUE ANALGESIA		SIDE EFFECTS					
			Total Dose- Fentanyl (μg)	Timing of First Dose (mins)	PONV	BRADY	RESP DEP	Pruritis	Sedation at end of 48 hrs	Hypotension
21	Gomathi	26	425	30	0	0	0	0	2	0
22	Devi	25	300	25	0	0	0	0	3	0
23	Girija	25	325	60	0	0	0	0	3	0
24	Manimegalai	22	375	45	0	0	0	0	4	0
25	Sangeetha	20	400	90	0	0	1	0	2	0
26	Sathya	25	425	60	0	0	0	0	3	0
27	Eromiya	24	525	75	1	0	0	0	3	0
28	Nagammal	23	325	60	1	0	1	0	3	0
29	Nithya	25	400	45	0	0	0	0	2	0
30	Lakshmi	32	450	30	0	0	0	0	3	0
31	Ramya	21	450	45	0	0	0	0	2	0
32	Ramya	25	520	60	0	0	1	0	3	0
33	Shakila	23	480	25	0	0	1	0	3	0
34	Poongavanam	28	360	45	0	0	0	0	4	0
35	Sargunam	35	420	40	0	0	0	0	2	0
36	Asha	25	400	35	0	0	0	0	2	0
37	Priya	23	380	15	0	0	0	0	2	0
38	Rani	28	440	55	0	0	0	0	4	0
39	Magdalin Mary	26	460	25	0	0	0	0	2	0
40	Datchayini	26	380	40	0	0	1	0	2	0

GROUP T – TRANSVERSE ABDOMINIS PLANE BLOCK											
S No	Name	Age	VAS SCORE								
			15 min	30 min	2 hrs	4 hrs	6 hrs	8 hrs	12 hrs	24 hrs	36hrs	48 hrs
1	Arthi	23	84	87	92	87	80	78	89	84	89	78
2	Sathya	22	72	74	89	90	88	88	78	72	72	80
3	Devi	26	92	86	96	92	86	87	82	80	76	72
4	Abirami	21	74	72	86	88	82	84	81	72	80	80
5	Hemapriya	23	88	84	80	76	72	80	90	90	92	85
6	Velva	30	74	96	89	82	84	88	82	80	78	76
7	Kavitha	29	108	100	99	98	88	106	99	98	86	88
8	Jeyanthi	22	80	84	76	84	98	88	96	76	85	86
9	Jothi	28	99	96	82	84	82	76	80	82	84	82
10	Durga	21	70	69	72	79	74	74	78	62	76	68
11	Velvizhi	32	88	86	72	74	70	78	72	75	76	70
12	Rukmani	35	92	94	86	88	82	89	76	78	82	80
13	Sathya	21	74	82	88	84	82	76	74	78	70	82
14	Latha Ramesh	26	84	82	90	88	87	90	82	78	80	76
15	Jennifer	21	96	88	90	102	88	98	90	92	90	88
16	Revathy	33	82	92	106	98	80	82	80	78	72	74
17	Devi	26	72	82	86	74	88	76	78	82	80	80
18	Annapoorani	28	70	72	64	74	80	89	80	86	72	67
19	Dhanalakshmi	32	88	96	92	102	88	76	72	70	76	74
20	Divya	22	80	76	80	86	84	82	89	76	78	78

GROUP C – NO TAP BLOCK												
S No	Name	Age	VAS SCORE									
			15 min	30 min	2 hrs	4 hrs	6 hrs	8 hrs	12 hrs	24 hrs	36hrs	48 hrs
21	Gomathi	26	64	68	72	80	76	72	68	67	68	70
22	Devi	25	78	82	84	79	76	82	88	86	84	82
23	Girija	25	82	88	86	84	82	80	76	76	72	69
24	Manimegalai	22	78	82	88	89	74	68	76	80	82	88
25	Sangeetha	20	98	90	96	80	84	82	80	80	84	84
26	Sathya	25	88	84	98	98	92	84	78	80	85	84
27	Eromiya	24	78	72	80	88	80	82	80	86	84	74
28	Nagammal	23	69	70	64	72	74	72	80	68	72	70
29	Nithya	25	78	64	70	89	70	86	88	74	62	74
30	Lakshmi	32	80	82	96	98	88	88	84	82	90	76
31	Ramya	21	76	78	88	72	76	74	78	86	86	82
32	Ramya	25	82	78	86	78	72	82	84	82	80	91
33	Shakila	23	88	92	98	89	64	80	82	78	77	78
34	Poongavanam	28	85	106	96	92	90	82	67	72	78	82
35	Sargunam	35	84	86	98	88	76	82	80	82	86	78
36	Asha	25	82	76	73	78	82	87	78	74	78	80
37	Priya	23	112	108	100	99	106	92	92	89	88	86
38	Rani	28	68	78	94	88	82	78	84	88	92	82
39	Magdalin Mary	26	82	88	94	80	86	84	80	82	78	80
40	Datchayini	26	116	110	84	56	60	52	76	54	56	62

GROUP T – TRANSVERSE ABDOMINIS PLANE BLOCK											
S No	Name	Age	HEART RATE								
			15 min	30 min	2 hrs	4 hrs	6 hrs	8 hrs	12 hrs	24 hrs	36hrs	48 hrs
1	Arthi	23	110	116	124	112	110	116	108	110	120	124
2	Sathya	22	116	120	105	110	116	112	112	107	119	120
3	Devi	26	132	136	124	120	132	130	126	112	125	126
4	Abirami	21	128	122	132	134	128	120	117	128	120	116
5	Hemapriya	23	108	112	102	98	98	100	98	104	102	100
6	Velva	30	142	128	132	126	120	116	120	118	124	108
7	Kavitha	29	124	116	114	132	136	122	108	116	110	114
8	Jeyanthi	22	108	124	128	132	124	120	118	120	104	112
9	Jothi	28	98	118	102	96	100	108	104	96	98	96
10	Durga	21	104	112	108	128	130	116	108	114	118	120
11	Velvizhi	32	119	124	120	112	110	110	120	112	114	110
12	Rukmani	35	100	112	128	112	110	104	100	98	98	102
13	Sathya	21	128	124	128	132	120	118	124	112	110	120
14	Latha Ramesh	26	106	122	106	110	112	110	98	96	98	114
15	Jennifer	21	100	114	112	118	124	122	108	102	100	102
16	Revathy	33	104	132	128	126	122	120	120	110	112	108
17	Devi	26	98	104	116	120	102	100	104	106	106	112
18	Annapoorani	28	106	102	108	110	116	110	104	110	112	120
19	Dhanalakshmi	32	116	112	128	140	126	124	123	120	114	116
20	Divya	22	118	116	115	112	110	110	112	110	108	110

GROUP C – NO TAP BLOCK												
S No	Name	Age	HEART RATE									
			15 min	30 min	2 hrs	4 hrs	6 hrs	8 hrs	12 hrs	24 hrs	36hrs	48 hrs
21	Gomathi	26	102	116	126	128	130	132	132	120	126	128
22	Devi	25	122	120	120	110	116	118	112	104	108	116
23	Girija	25	108	112	123	128	120	118	108	112	106	108
24	Manimegalai	22	112	112	116	130	122	124	118	112	114	112
25	Sangeetha	20	106	104	116	124	122	126	114	112	116	108
26	Sathya	25	110	114	112	116	110	104	106	112	112	110
27	Eromiya	24	112	112	110	104	110	112	112	116	112	112
28	Nagammal	23	106	110	108	108	110	108	116	112	102	108
29	Nithya	25	96	102	104	98	98	96	98	100	98	94
30	Lakshmi	32	114	110	116	112	130	128	124	123	112	110
31	Ramya	21	112	132	120	120	110	118	115	108	108	110
32	Ramya	25	100	108	112	106	108	102	100	100	110	108
33	Shakila	23	110	104	108	106	120	110	106	108	110	126
34	Poongavanam	28	99	106	108	110	124	122	114	110	108	112
35	Sargunam	35	118	104	106	110	110	110	108	112	118	110
36	Asha	25	100	112	98	96	98	112	102	98	100	100
37	Priya	23	116	112	108	110	116	120	118	110	106	112
38	Rani	28	108	116	118	112	104	100	108	108	100	112
39	Magdalin Mary	26	116	110	106	112	124	128	118	116	116	112
40	Datchayini	26	110	112	112	120	124	124	126	128	120	116

GROUP T – TRANSVERSE ABDOMINIS PLANE BLOCK											
S No	Name	Age	SYSTOLIC BLOOD PRESSURE								
			15 min	30 min	2 hrs	4 hrs	6 hrs	8 hrs	12 hrs	24 hrs	36hrs	48 hrs
1	Arthi	23	64	70	72	68	68	54	60	68	72	76
2	Sathya	22	72	74	76	76	70	75	72	78	68	66
3	Devi	26	75	86	84	85	80	80	84	84	82	86
4	Abirami	21	65	72	88	84	80	80	74	76	72	70
5	Hemapriya	23	48	52	64	56	62	56	58	62	60	62
6	Velva	30	82	86	86	76	72	78	76	72	68	68
7	Kavitha	29	71	67	62	84	82	74	72	68	66	68
8	Jeyanthi	22	56	87	82	90	80	79	86	82	78	67
9	Jothi	28	48	78	72	64	68	74	72	74	68	64
10	Durga	21	62	68	74	72	88	76	68	62	70	68
11	Velvizhi	32	67	58	74	78	78	74	86	78	82	80
12	Rukmani	35	51	62	72	66	68	72	68	62	60	76
13	Sathya	21	68	82	86	94	82	78	80	72	68	74
14	Latha Ramesh	26	58	78	72	66	68	72	66	68	60	67
15	Jennifer	21	62	64	72	76	84	68	72	70	70	68
16	Revathy	33	56	72	78	76	80	78	72	68	68	64
17	Devi	26	48	62	62	68	68	70	72	68	68	70
18	Annapoorani	28	48	52	56	54	48	56	54	54	58	62
19	Dhanalakshmi	32	72	76	74	84	74	72	78	75	78	76
20	Divya	22	68	66	68	64	64	68	69	62	66	62

GROUP C – NO TAP BLOCK												
S No	Name	Age	SYSTOLIC BLOOD PRESSURE									
			15 min	30 min	2 hrs	4 hrs	6 hrs	8 hrs	12 hrs	24 hrs	36hrs	48 hrs
21	Gomathi	26	82	78	84	84	88	82	78	76	74	73
22	Devi	25	84	80	78	78	84	68	66	63	64	68
23	Girija	25	68	72	78	84	80	78	78	76	74	72
24	Manimegalai	22	68	76	74	70	62	68	64	63	64	66
25	Sangeetha	20	78	76	80	80	82	74	72	74	76	70
26	Sathya	25	64	64	66	68	62	64	64	68	66	68
27	Eromiya	24	56	56	58	62	62	60	66	64	68	64
28	Nagammal	23	68	74	78	74	76	74	76	70	72	72
29	Nithya	25	56	54	52	56	60	56	56	54	52	53
30	Lakshmi	32	78	86	82	78	78	74	74	76	76	78
31	Ramya	21	62	54	58	68	80	64	72	74	70	70
32	Ramya	25	60	62	58	68	62	64	58	56	62	56
33	Shakila	23	72	70	82	74	72	76	72	68	64	76
34	Poongavanam	28	62	56	58	60	54	50	52	54	56	59
35	Sargunam	35	72	76	74	78	62	64	68	74	68	72
36	Asha	25	48	52	56	54	52	68	62	64	60	58
37	Priya	23	72	68	82	68	63	72	68	72	70	74
38	Rani	28	72	72	68	64	68	68	64	72	70	68
39	Magdalin Mary	26	68	74	72	72	68	62	64	66	68	68
40	Datchayini	26	76	74	80	82	82	84	86	82	78	72

GROUP T – TRANSVERSE ABDOMINIS PLANE BLOCK											
S No	Name	Age	DIASTOLIC BLOOD PRESSURE								
			15 min	30 min	2 hrs	4 hrs	6 hrs	8 hrs	12 hrs	24 hrs	36hrs	48 hrs
1	Arthi	23	79	85	89	83	82	75	76	82	88	92
2	Sathya	22	87	89	86	87	85	87	85	88	85	84
3	Devi	26	94	103	97	97	97	97	98	93	96	99
4	Abirami	21	86	89	103	101	96	93	88	93	88	85
5	Hemapriya	23	68	72	77	70	74	71	71	76	74	75
6	Velva	30	102	100	101	93	88	91	91	87	87	81
7	Kavitha	29	89	83	79	100	100	90	84	84	81	83
8	Jeyanthi	22	73	99	97	104	95	93	97	95	87	82
9	Jothi	28	65	91	82	75	79	85	83	81	78	75
10	Durga	21	76	83	85	91	102	89	81	79	86	85
11	Velvizhi	32	84	80	89	89	89	86	97	89	93	90
12	Rukmani	35	67	79	91	81	82	83	79	74	73	85
13	Sathya	21	88	96	100	107	95	91	95	85	82	89
14	Latha Ramesh	26	74	93	83	81	83	85	77	77	73	83
15	Jennifer	21	75	81	85	90	97	86	84	81	80	79
16	Revathy	33	72	92	95	93	94	92	88	82	83	79
17	Devi	26	65	76	80	85	79	80	83	81	81	84
18	Annapoorani	28	67	69	73	73	71	74	71	73	76	81
19	Dhanalakshmi	32	87	88	92	103	91	89	93	90	90	89
20	Divya	22	85	83	84	80	79	82	83	78	80	78

GROUP C – NO TAP BLOCK												
S No	Name	Age	DIASTOLIC BLOOD PRESSURE									
			15 min	30 min	2 hrs	4 hrs	6 hrs	8 hrs	12 hrs	24 hrs	36hrs	48 hrs
21	Gomathi	26	89	91	98	99	102	99	96	91	91	91
22	Devi	25	97	93	92	89	95	85	81	77	79	84
23	Girija	25	81	85	93	99	93	91	88	88	85	84
24	Manimegalai	22	83	88	88	90	82	87	82	79	81	81
25	Sangeetha	20	87	85	92	95	95	91	86	87	89	83
26	Sathya	25	79	81	81	84	78	77	78	83	81	82
27	Eromiya	24	75	75	75	76	78	77	81	81	83	80
28	Nagammal	23	81	86	88	85	87	85	89	84	82	84
29	Nithya	25	69	70	69	70	73	69	70	69	67	67
30	Lakshmi	32	90	94	93	89	95	92	91	92	88	89
31	Ramya	21	79	80	79	85	90	82	86	85	83	83
32	Ramya	25	73	77	76	81	77	77	72	71	78	73
33	Shakila	23	85	81	91	85	88	87	83	81	79	93
34	Poongavanam	28	74	73	75	77	77	74	73	73	73	77
35	Sargunam	35	87	85	85	89	78	79	81	87	85	85
36	Asha	25	65	72	70	68	67	83	75	75	73	72
37	Priya	23	87	83	91	82	81	88	85	85	82	87
38	Rani	28	84	87	85	80	80	79	79	84	80	83
39	Magdalin Mary	26	84	86	83	85	87	84	82	83	84	83
40	Datchayini	26	87	87	91	95	96	97	99	97	92	87

GROUP T – TRANSVERSE ABDOMINIS PLANE BLOCK											
S No	Name	Age	MAP								
			15 min	30 min	2 hrs	4 hrs	6 hrs	8 hrs	12 hrs	24 hrs	36hrs	48 hrs
1	Arthi	23	79	85	89	83	82	75	76	82	88	92
2	Sathya	22	87	89	86	87	85	87	85	88	85	84
3	Devi	26	94	103	97	97	97	97	98	93	96	99
4	Abirami	21	86	89	103	101	96	93	88	93	88	85
5	Hemapriya	23	68	72	77	70	74	71	71	76	74	75
6	Velva	30	102	100	101	93	88	91	91	87	87	81
7	Kavitha	29	89	83	79	100	100	90	84	84	81	83
8	Jeyanthi	22	73	99	97	104	95	93	97	95	87	82
9	Jothi	28	65	91	82	75	79	85	83	81	78	75
10	Durga	21	76	83	85	91	102	89	81	79	86	85
11	Velvizhi	32	84	80	89	89	89	86	97	89	93	90
12	Rukmani	35	67	79	91	81	82	83	79	74	73	85
13	Sathya	21	88	96	100	107	95	91	95	85	82	89
14	Latha Ramesh	26	74	93	83	81	83	85	77	77	73	83
15	Jennifer	21	75	81	85	90	97	86	84	81	80	79
16	Revathy	33	72	92	95	93	94	92	88	82	83	79
17	Devi	26	65	76	80	85	79	80	83	81	81	84
18	Annapoorani	28	67	69	73	73	71	74	71	73	76	81
19	Dhanalakshmi	32	87	88	92	103	91	89	93	90	90	89
20	Divya	22	85	83	84	80	79	82	83	78	80	78

GROUP C – NO TAP BLOCK												
S No	Name	Age	MAP									
			15 min	30 min	2 hrs	4 hrs	6 hrs	8 hrs	12 hrs	24 hrs	36hrs	48 hrs
21	Gomathi	26	89	91	98	99	102	99	96	91	91	91
22	Devi	25	97	93	92	89	95	85	81	77	79	84
23	Girija	25	81	85	93	99	93	91	88	88	85	84
24	Manimegalai	22	83	88	88	90	82	87	82	79	81	81
25	Sangeetha	20	87	85	92	95	95	91	86	87	89	83
26	Sathya	25	79	81	81	84	78	77	78	83	81	82
27	Eromiya	24	75	75	75	76	78	77	81	81	83	80
28	Nagammal	23	81	86	88	85	87	85	89	84	82	84
29	Nithya	25	69	70	69	70	73	69	70	69	67	67
30	Lakshmi	32	90	94	93	89	95	92	91	92	88	89
31	Ramya	21	79	80	79	85	90	82	86	85	83	83
32	Ramya	25	73	77	76	81	77	77	72	71	78	73
33	Shakila	23	85	81	91	85	88	87	83	81	79	93
34	Poongavanam	28	74	73	75	77	77	74	73	73	73	77
35	Sargunam	35	87	85	85	89	78	79	81	87	85	85
36	Asha	25	65	72	70	68	67	83	75	75	73	72
37	Priya	23	87	83	91	82	81	88	85	85	82	87
38	Rani	28	84	87	85	80	80	79	79	84	80	83
39	Magdalin Mary	26	84	86	83	85	87	84	82	83	84	83
40	Datchayini	26	87	87	91	95	96	97	99	97	92	87